The Dental Digest.

Vol. IX. CHICAGO, FEBRUARY, 1903. No. 2.

Original Contributions.

STRUCTURE OF THE ENAMEL IN ITS RELATION TO THE FORMATION OF THE WALLS AND MARGINS OF CAVITIES. (CUSPS AND MARGINAL RIDGES.)

BY F. B. NOYES, D.D.S., CHICAGO, READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

In looking over the literature on this subject one is impressed with the extent to which the study of the enamel has been limited to matters of abstract structure and to manner of development; with special reference to the possible relation of these to disease conditions, almost nothing appearing as to the structure of the tissue in relation to the formation of cavity walls and margins. This has seemed the more remarkable to me, since the first structural characteristic of the tissue to be described by investigators is the fact that it is composed of rodlike fibres or prisms cemented together, and the most striking property of the tissue in manipulation is its tendency to split or cleave along the length of the prisms. It would seem that one of the first things to invite investigation would be the arrangement of these structural elements with reference to the formation of cavity walls. Almost the only thing in the literature on this subject which I have been able to find is a series of articles in the *Cosmos* of 1891 by Dr. G. V. Black.

It is not my purpose to go into a discussion of enamel structure in the abstract, but in view of certain conflicting statements in textbooks, which should be authority upon the subject, it seems to demand a few words. Dr. John Tomes of England was the first to describe in detail the structure of the enamel, and in most respects his interpretation of structure is recognized today as correct, but in certain things he was misled by his views of enamel development.

Most writing can be traced back to him as authority, and these points are creating confusion in the profession and especially in the minds of students today. Tomes considered the enamel to be formed

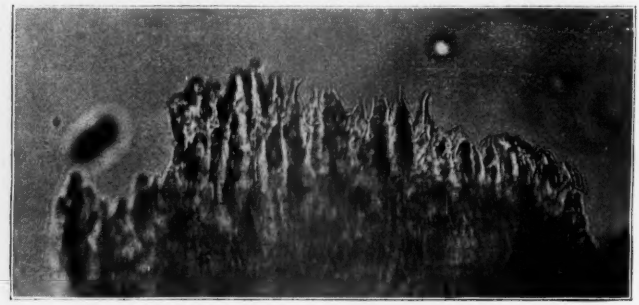


FIG. 1.

by the direct calcification of the ameloblast or enamel-forming cells, the deposit of calcium salts beginning in the periphery of the cells; consequently he stated that in the cleavage of enamel the rods split

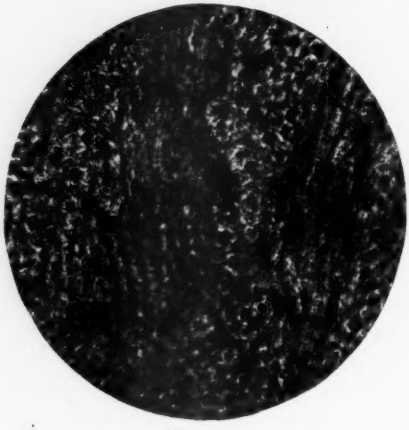


FIG. 2.

at their centers, and in decalcification the substance of the rods was more easily soluble than the substance between the rods. These statements have been so completely disproven, and the reverse has been so perfectly demonstrated by Miller, Black and Williams, that

they should not be repeated in standard text-books today, but you will find these statements in the latest and best works on histology.

It needs no extended study of the tissue to satisfy oneself on this point. Miller, Black and Williams have shown that in caries of the enamel the acids produced dissolve the interprismatic substance, finally separating rod from rod. One need only examine enamel debris from a carious cavity to demonstrate the point, showing the ends of the rods projecting like the pickets of a fence (Fig. 1). The best demonstration, however, is obtained by grinding a thin section at right angles to the rods, and after polishing the surfaces

FIG. 3.

and studying the section under the microscope, remove the section, cover one side with vaselin and etch the other surface for thirty seconds with five per cent hydrochloric acid, and remount, etched side up. That the cementing substance is removed and the enamel prisms are left much more distinctly outlined will be most evident. I have attempted to show this in photographs, but they do not do justice to the sections because of the restriction of focus to one plane (Figs. 2 and 3).

The same text referred to above follows the German author in translation, with the statement that because of the greater area of the outer as compared with the inner surface of the enamel, the enamel prisms are greater in diameter at their outer than their inner extremities. I do not know upon what observations this state-

ment is based, but so far as my studies go it certainly has no foundation in fact. According to my observation, the difference in diameter of enamel prisms at the surface of the tooth and the surface of the dentin must be very slight indeed, and not at all sufficient to account for the greater area.

There seem to me to be two reasons for the scanty writing on the relation of enamel structure to cavity walls. The first is the complexity of the fibrous structure of the tissue in many places, and the second is the difficulty of showing from sections the relation

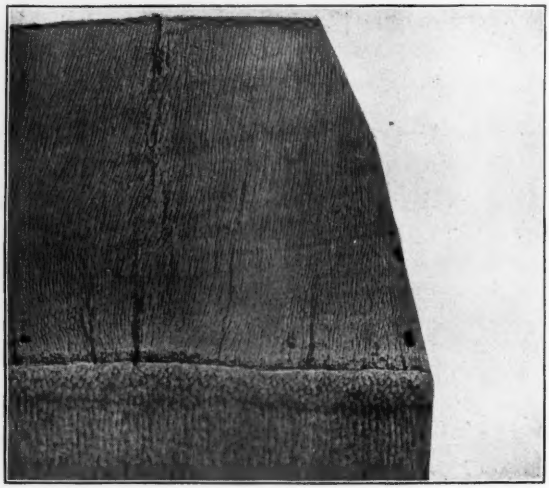


FIG. 4.

of rod-direction to the entire crown as we look at the tooth in operating.

I do not like the word fibre or fibrous structure as applied to the enamel, for it seems to me to have associated with it the idea of a soft or elastic substance, while the enamel is rather to be compared to a wall of solid masonry, composed of very slender, irregular prismatic columns fastened together by cement of almost the same density. The arrangement of these columns may be simply straight and parallel with each other, or they may be wound and twisted about each other in the most complicated form. Naturally the ar-

rangement of the structural element in this wall is of the greatest importance to one who would repair damages in it and build thereon a strong edifice. Naturally, too, where the enamel rods are straight and parallel the tissue breaks down easily before cutting instruments and the tooth may feel "soft," while the gnarled and twisted structure is as hard to cut as a pine knot, but the calcific composition of the two might be the same, and their resistance to the advancement of caries identical. In almost all positions, except sometimes over the point of the dentin cusp, the gnarled condition does not extend to the surface, but the outer parts of the rods are straight and parallel, so that the outer portion may cleave easily, leaving a layer of enamel next to the dentin which it is extremely hard to remove.

FIG. 5.

FIG. 6.

While the enamel is the hardest known organized tissue, it has little elasticity. In other words, if perfectly supported by the dentin beneath it will sustain great force and resist abrasion, but if its structural elements are not supported it will fracture easily on the lines of the cementing substance, here and there breaking across the rods, especially where they twist about each other.

Taking these characteristics of the tissue as sufficiently demonstrated, the structural requirements for strength of an enamel wall may be stated as follows: 1. The enamel must be supported upon sound dentin. 2. All of the prisms which enter into the formation of the wall must have their inner end supported by the dentin. 3. The prism which forms the cavo-surface angle must be supported by shorter prisms, which will be covered in by the falling material. 4. The cavo-surface angle must be so formed as not to

fracture the ends of the prism in condensing the filling material against them.

These conditions must be met in all positions in order to pro-

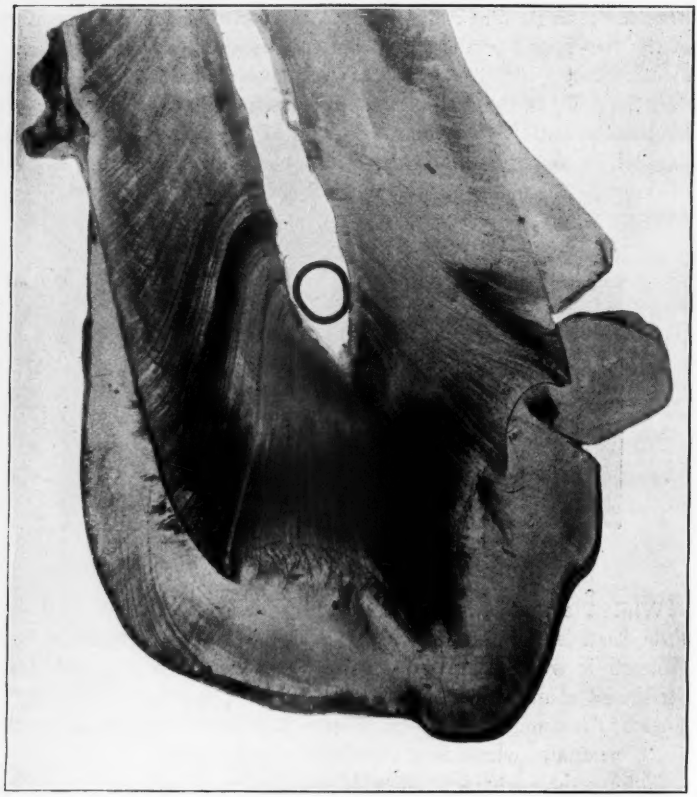


FIG. 7.

duce a wall against which gold can be condensed, or which will sustain continuously the forces to which it will be subjected afterwards. The filling material can never be made to support the enamel in the same sense as the dentin did, upon which it was formed, and it is

best that enamel walls be considered no stronger after filling than if left empty.

Fig. 4 shows the conditions which are fundamental in the

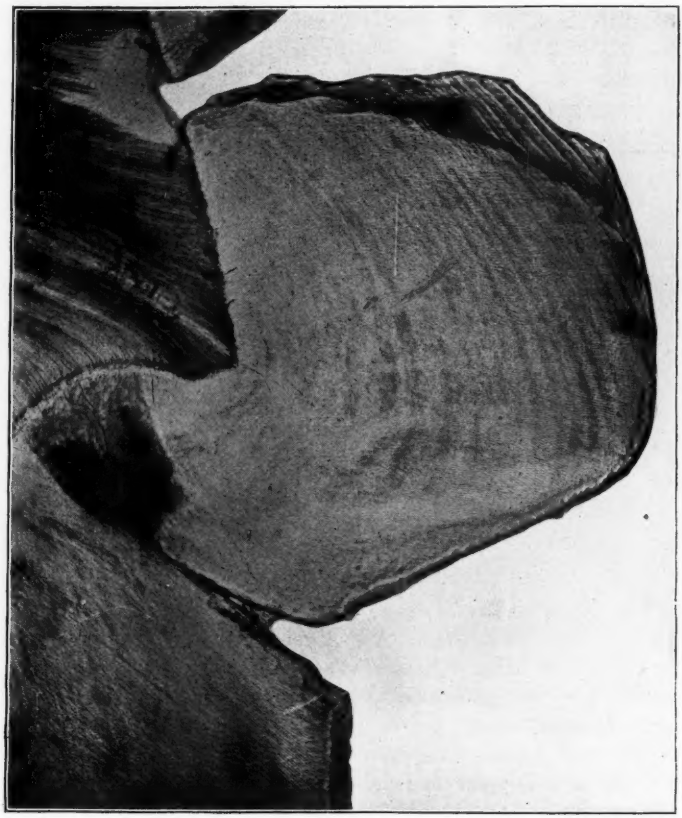


FIG. 8.

formation of strong enamel walls in all positions, though the means of producing the conditions must be modified in various parts of the tooth. The enamel which forms the wall is all supported by sound dentin, upon which the inner ends of the rods rest, and the rod

forming the cavo-surface angle is supported by a mass of enamel rods covered in by filling material.

From even a superficial examination of the arrangement of the enamel rods in the architecture of the tooth crown it is seen that, beginning at the gingival line, they are inclined apically from the horizontal plane, and passing occlusally they reach the horizontal plane at a little below the middle of the axial surface on bicuspids and molars, and about the junction of middle and gingival thirds on incisors and cuspids, so at that point they are at right angles to

FIG. 9.

FIG. 10.

the axis of the tooth. Passing occlusally from here, they incline more and more occlusally until at some point over the point of the cusp or occlusal edge they reach the axial plane, but here they are often very much twisted and contain many short rods. Passing over this point down the central incline, they are inclined away from the axial and toward the grooves or pits, the degree of inclination depending largely upon the height and inclination of the cusps.

This arrangement gives us cavities with two classes of enamel walls—1. Cavities where the enamel prisms are inclined toward the cavity, characteristic of occlusal surfaces, molars and bicuspids, and lingual pits of incisors and cuspids. 2. Cavities where the enamel prisms are inclined away from the cavity, characteristic of axial surface cavities.

It need hardly be said that in the first it is usually easy to

produce a strong wall, while in the second it is always difficult. Fortunately, however, the latter are not subjected to stress after the filling is inserted, but the wall must be strong enough to sustain

FIG. 11.

the condensation of gold against it, which it will not do unless constructed in accordance with the structural requirements described.

Before going any further it is necessary to say something of

how these principles are to be studied and followed out in practice. First, it is very essential to have some knowledge of enamel structure and rod-direction, obtained best, of course, by the study of ground sections under the microscope. Next in value to direct observation is the study of photographic prints, which allow the use of a reading-glass to bring out detail, but unfortunately half-tone reproductions will not allow of this because of the screen used in etching. After this basis of interpretation is gained, knowledge of enamel-rod direction is to be constantly studied by the feeling and action of the tissue under hand-cutting instruments, interpreting observations in terms of microscopic structure.

FIG. 12.

FIG. 13.

In preparing an enamel wall the first opening may be made with a bur, and the cavity may be extended more or less in the same way, but then if you are to know anything of the structure of the wall which you form, the direction of the rods must be determined by cleaving with a hand instrument. A chisel or hatchet is applied to the surface and force is applied in the direction the enamel prisms should run—a piece splits out and you may find that the direction is not quite what you thought it would be. This cleavage represents fairly accurately the rod-direction, but it may have broken across a few rods, so the enamel wall should be smoothed by a planing motion of a sharp chisel or hatchet, so as to extend the inclination of the wall slightly. Then the cavo-surface angle may or may not be beveled as the position demands and the amount of inclination of the wall indicates.

In the development of the tooth the formation of enamel begins at separate centers located at the junction of the dentin, and corresponding with the tips of the dentin cusps in the multicusped

FIG. 14.

teeth and with the mamelons in incisors. The formation of dentin slightly precedes the enamel and proceeds from without inward, the enamel from within outward. After the calcification has begun at

these centers, which are at first close together, the growth of the tooth germ moves them farther and farther apart, until the full size of the dentin surface is reached and calcifications from the separate centres unite, after which there is no further increase in size save by the growth of enamel on the surface.

FIG. 15.

The enamel first formed at these centers seems to be often imperfect, and the rod-directions are usually very irregular and twisted about each other; also the point at which the tooth surface is first completed is not at the tip of the enamel cusp, but at the point directly over the tip of the dentin cusp, which is slightly axially from

FIG. 16.

the tip of the enamel cusps. This area is a position of weakness for enamel margins.

We may take a series of bucco-lingual sections of bicuspids

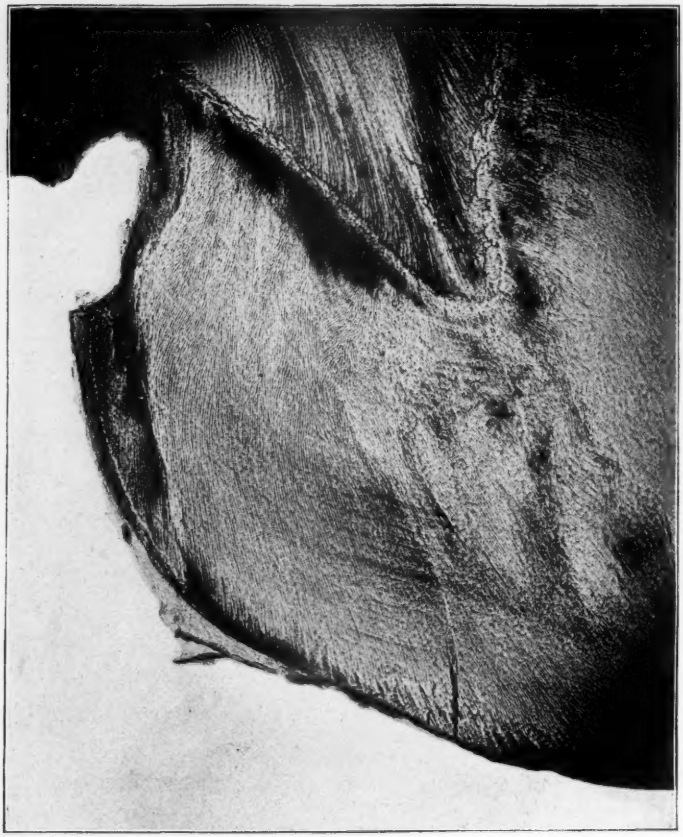


FIG. 17.

and molars to show these things, as the record is left in the formed tissue. The brown lines sweeping around the cusps obliquely through the enamel, the bands of Retzius, stratification bands or incemental lines, indicate the portions of the enamel, which were

in process of calcification at the same time. At first the two centers were close together, but they were carried farther and farther apart as the development of enamel was carried farther and farther down the dentin cusp. Finally the calcification from the two centers united at the point which is directly under the surface groove and proceeded outward, but the tall column cells projecting from the forming surface more and more interfered with the nutrition of the ones at the point of union. Here the formation was first slowed, then stopped, and a fissure was produced. The dip of the bands of Retzius at these grooves is a record of this retarding of development.

While the defects of structure which produce lines of weakness

FIG. 18.

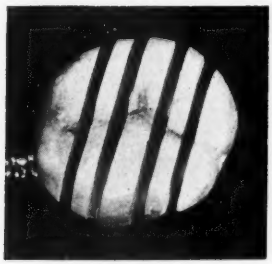


FIG. 19.

in the enamel are easily observed on the occlusal surfaces of bicuspids and molars, they must be recognized upon the axial surface as well and must be looked for in all the teeth.

The surface markings indicate the lines of union of the portions calcifying from various centers, and these lines are lines of weakness, and whenever a cavity wall approaches them closely it must be carried beyond them, cutting them out. Even where the surface is perfect the disturbance in the arrangement of the enamel rods may be shown in sections.

The tips of cusps and summits of marginal ridges are positions of strength and areas of immunity in the perfect structure, but they become positions of weakness when the continuity of the tissue is broken or a cavity margin is made to approach them too closely.

FIG. 20.

Bucco-lingual sections of bicuspids and molars will show the general conditions.

Having studied the general arrangement of the enamel prisms in relation to the structural requirements for strength, and noted the imperfections of a structure as affecting the position of cavity margins, it remains to study each tooth much more carefully by cutting sections in the positions of cavity margins and examining the structure as shown in the sections. In this I have not been able to do as much work as I had hoped, but I think there is enough to show that the continuance of the plans may bring knowledge of structure and manner of practice closer together.

The first tooth selected was a superior first bicuspid. With a

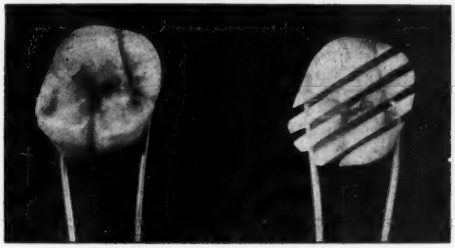


FIG. 21. FIG. 22.

diamond disk it was cut through from mesial to distal, as shown in Fig. 5, of the occlusal surface. Fig. 6 shows the mesial surface. The pieces were then cut off and ground, so as to leave the sections from the buccal and lingual pieces as close to the cut as possible. Unfortunately the central piece was lost after grinding. In Fig. 6 a slight discolored spot will be seen at what was the contact point. Fig. 7 shows the buccal section. The enamel was so much affected, and the cementing substance so dissolved out from between the rods at the spot shown, that the tissue went to pieces in grinding, though the surface was unbroken when grinding was commenced, and the action on the dentin can be clearly seen. Notice the position of the oblique grooves and the enamel forming the mesial marginal ridge. If this cavity were prepared as a simple proximal cavity, the occlusal wall would require to be inclined occlusally about 10 centigrades from the horizontal; the gingival wall extended gingivally and in-

FIG. 23.

clined about 6 centigrades gingivally from the horizontal. The fallacy of such preparation is well illustrated in Fig. 8, showing the structure of the marginal ridge over to the oblique groove. The

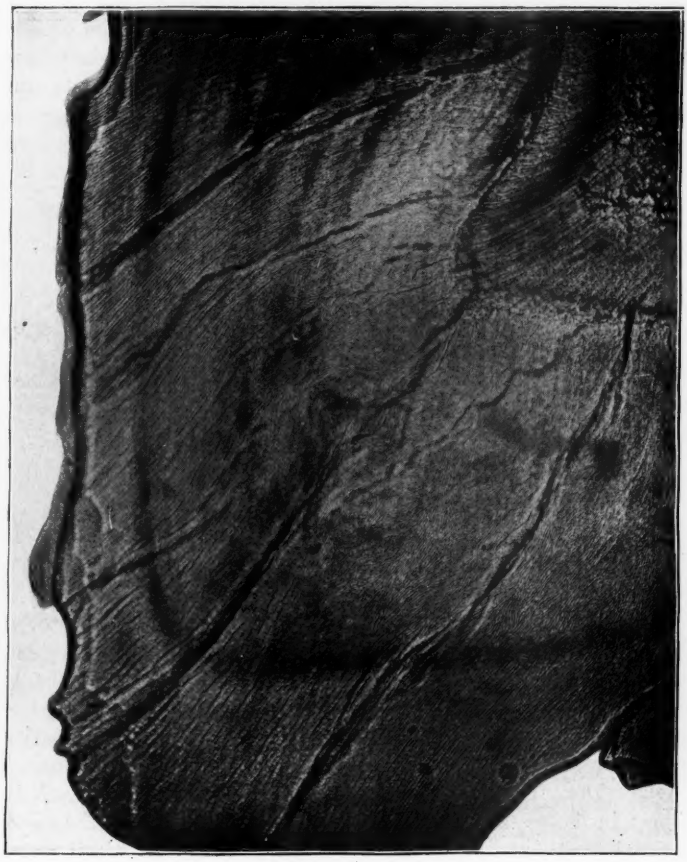


FIG. 24.

cavity wall reaches the area where the rods are becoming very much inclined occlusally, passing over the marginal ridge, and that portion of enamel is practically unsupported and will break out from the

force coming on it from occlusion, and that is the way it acts in practice.

A second bicuspid was cut in the same way. The occlusal surface was very perfect. Figs. 9 and 10 show the position of the cuts from the occlusal and the mesial. In these grindings there is little of special interest except the perfection of structure in the oblique grooves, and the extent to which the apparently slight decay has affected the tissue at the contact points, as shown in Fig. 11, the cementing substance being so softened that the tissue has broken out in grinding. Again, the lingual piece is too much across the rods to show them well. I wish to call attention again, however, to the

FIG. 25.

similarity of structure over marginal ridges and the tips of cusps, as shown in the earlier bucco-lingual sections.

A third bicuspid was cut, attempting to bring the sections in the line of large compound mesio or disto-occlusal cavities. The tooth as sawed is shown in Fig. 12 from the occlusal, and in Fig. 13 from the proximal. The buccal and lingual pieces were ground so as to show the buccal and lingual walls of a disto-occlusal cavity, and the mesial and distal pieces were ground so as to show the lingual sides. Notice the appearance of the mesial pit as it will be shown in the section. Of these only the lingual wall of the disto-occlusal cavity, and the section from the mesial piece, which shows the mesial pit, are reproduced.

Fig. 14 shows the lingual wall, and may be passed, stopping only to call attention to the outer straight and inner twisted arrangement of the rods on the occlusal as shown in higher power (Fig. 15).

The mesio-lingual piece (Fig. 16) shows the decay in the pit

and the structure of the mesial marginal ridge, and Fig. 17, a higher power, shows the rod-directions better. This is a splendid illustration of what may occur when margins approach a marginal ridge. Notice the direction of the rods as the tip of the dentin ridge is approached. In that position it would be impossible not to have unsupported rods which would be sure to loosen sooner or later, and if that point is reached the margin must be carried to where the structure can be trusted.

The next tooth worked on was a lower third molar of very perfect form, which is interesting chiefly as showing the extent of

FIG. 26.

defect around apparently very good occlusal grooves, and the direction of rods on a very flat occlusal surface. Fig. 18 shows the occlusal surface and Fig. 19 the same after cutting. Numbering from the mesial, sections 1 and 2 were lost, but 3, 4 and 5 were mounted. Fig. 20 is from No. 3.

The upper first molar was selected as the next tooth, cutting so as to show the structure of the disto-lingual cusp and the enamel around the disto-lingual groove. Fig. 21 shows a typical first molar with fairly well closed developmental lines. Fig. 22 shows the direction of the cuts. From this tooth sections 1 and 2, numbering from the lingual, were lost; sections 3, 4 and 5 were mounted, but section 5 was of little value. Fig. 23 shows the cut through the crown in the position of section 3. There is shown the disintegration of the enamel in the region of the mesial pit, and the arrangement of

the rods over the disto-lingual cusp, which is a position of weakness, especially when caries of the disto-lingual groove is complicated by caries on the distal surface. In many such cases the only way a strong wall can be made is by removing the cusp and cutting from the point of the dentin cusp in the horizontal plane.

Another upper molar of less typical form was cut in the same

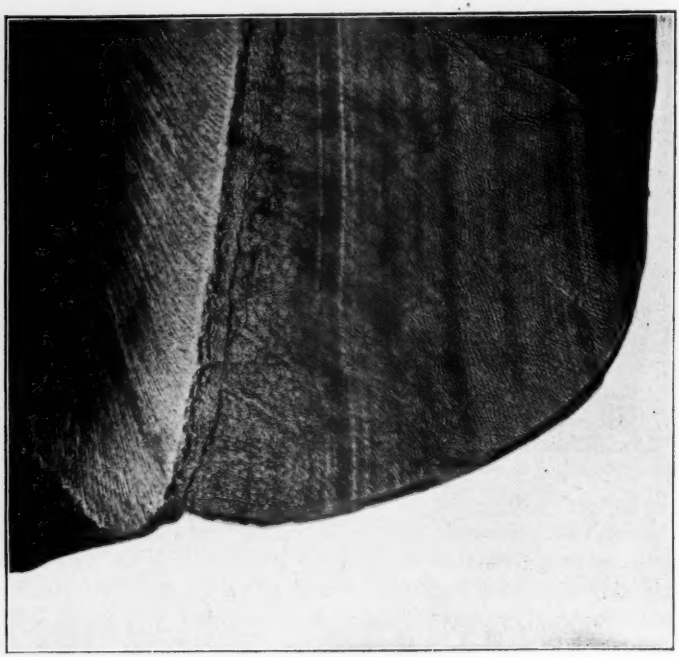


FIG. 27.

way. One of the sections showed the complicated condition of a rough occlusal surface, and especially the rod-direction over the distal marginal ridge. Notice the inclination distally from the bucco-linguo-axial plane as the ridge, which is very flat, is approached. This is seen in the higher power of the ridge (Fig. 24), which also shows the twisting of the rods over the dentin tip.

The central incisor was the last tooth to be worked on, and here

the only regions to which attention is called are the mesial and distal marginal ridges. Often proximal cavities extend far to the lingual, and we are tempted to leave a margin on the summit of the

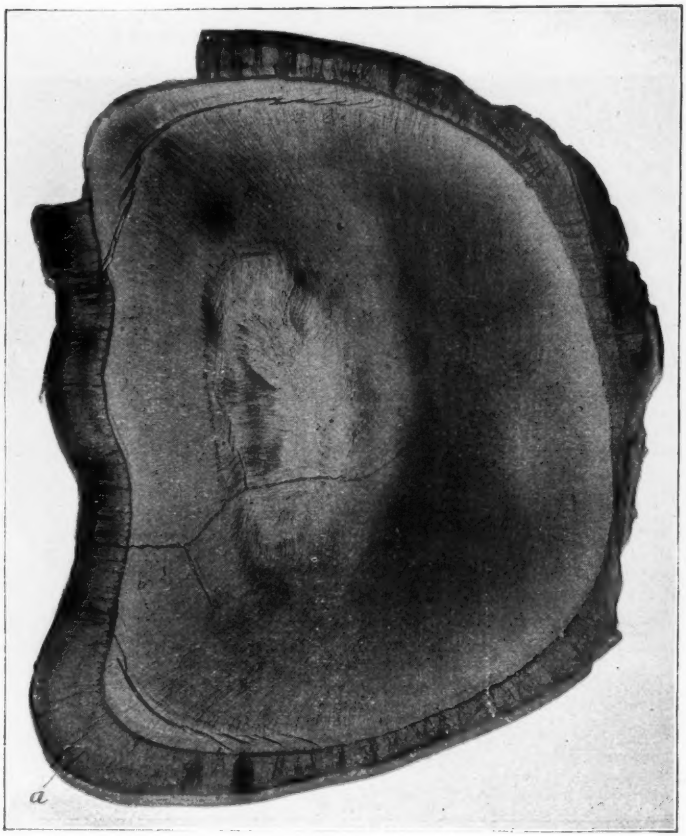


FIG. 28.

ridge. This is a point of weakness, to be compared to the tip of a cusp or the marginal ridges in bicuspids and molars.

An incisor was cut in a similar way (Fig. 25), from which sections 1, 2 and 3, numbering from the incisal, were mounted. No. 4

was broken. Fig. 26 is from the first section and shows the enamel worn off the marginal ridges near the occlusal edge. It is noticeable that wherever enamel is removed by abrasion the wall is left, fulfilling the requirements given for strong enamel walls. Next the dentin are short rods whose ends abut on the abraded surface, grow-

FIG. 29.

ing longer to the enamel surface. This is better shown in Fig. 27, a higher power of the corner, and in worn incisor tips. When decay occurs on these worn surfaces some of the short rods are broken out and decay begins at the dento-enamel junction. Fig. 28, from the second piece, cuts well through the marginal ridges in the middle of the crown, almost if not quite in the direction of the rods, and

shows the enamel over the distal ridge broken away, but the mesial ridge perfect. Suppose a mesial cavity whose margin is approaching this region, if it reaches the point (a) it must be cut well over onto the lingual, or the enamel will be broken out by the force of occlusion from the lingual, if it is not fractured in packing gold against it in making the filling. Fig. 29 shows the structure in the limited area more perfectly.

SURGICAL PROCEDURES IN ABSCESS OF THE MAXILLARY SINUS.

BY J. D. PATTERSON, D.D.S., KANSAS CITY, MO. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

It would be presumptuous for me to endeavor to instruct the members of this body upon a subject which is dealt with in text-books on surgery and dental surgery, and in the literature of journals and society proceedings, were it not that much of what I shall say is based upon the results of practical experience with a considerable number of cases during the last thirty-five years.

The point I desire to make is, that in disease of the maxillary sinus I am opposed to the so-frequently advocated penetration of that cavity immediately above the buccal roots of the first molar through the external wall of the sinus, and the reason I address you to-day is to give the history of a recent case in my practice in support of my opposition to this surgical procedure.

As regards opening at the point indicated I will make four criticisms—First, perfect drainage sought is not obtained. Second, if a sufficient opening, necessary for exploration and treatment, is made the thin wall removed is not reformed and an objectionable cicatrix of soft tissue results. Third, the origin of the masseter muscle and the attachment of the buccinator muscle are sometimes seriously impaired. Fourth, if the opening thus made extends to the lowest level of the sinus, the buccal roots of the molar teeth which the operation seems to conserve are laid bare and placed in an undesirable condition.

The advocates of this operation, on the other hand, put forward a

very meritorious claim when they assert that an opening sufficient for drainage, for the removal of tumors and for treatment can be made through the external wall without demanding the extraction of a tooth. Let us see if their claim holds good.

Of the treatment of abscess in the maxillary sinus it is often said that a cure is readily effected by penetration of the sinus and removal of inflammatory products, and that the operation is a minor one. While this is often true in cases of short-standing, my experience shows that a large majority of cases presented are of long-standing, the patient naturally being unaware of trouble until an engorged cavity causes bulging of the walls and inflammation, and fetid pus exudes into the nasal passages.

This may have given rise to tumors of the sinus, usually of a polypoid character, often resulting in softening of the walls and necrosis, and these complications demand the most intelligent and painstaking surgical care for their cure. As in all similar pathological tracts, the first procedure is the removal of the irritant; second, the removal of all inflammatory products, the establishment of an aseptic condition, and the most perfect drainage. In this I believe the opening advocated fails in disease of the maxillary sinus.

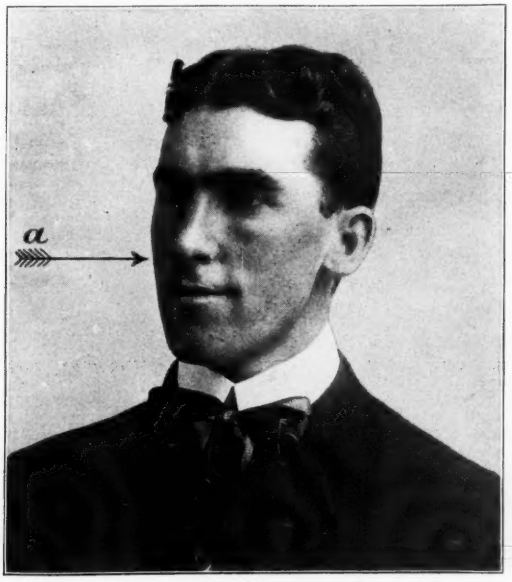
My first objection to the operation on the external wall is, that such an opening does not establish the most perfect or the best possible drainage. The best drainage embodies ready and continuous evacuation of all exudations and pus, so that additional poisoning of the tissues is not presented. The opening upon the external wall, even if it extends to the lowest level of the sinus, would give the best drainage only with the patient in a recumbent position and with the affected side lowest. It must also be remembered that the floor of the antrum is lower on the lingual than on the buccal side, so during the greater part of the twenty-four hours the exudations and exfoliated tissue from the operation would remain and produce new irritation by putrefaction and the growth of pathogenic germs.

The second objection to this opening is, that the thin bony wall is not again formed if the opening is sufficiently large, and if it is closed finally it is with cicatricial tissue, presenting a depression sometimes noticeable upon the contour of the cheek.

The third criticism, that the masseter and buccinator muscles are injured, applies where the opening is kept patulous for a long time. If the disease responds to treatment quickly there will be little in-

jury, but if a large opening is made and kept open for some weeks, as is necessary in severe cases, some of the fibers of these muscles severed will not reunite, and the muscular action on the affected side will be impaired.

The fourth criticism is, that the external opening made sufficiently large down to the lowest level may lay bare tooth roots. There is little room between the buccal roots of the molars for any consider-



a.—NORMAL CONTOUR.

able opening, and when the roots lie beyond the lower level of the sinus, as frequently occurs, they will be injured when the external opening is made, so that they may not return to a healthy state, for if the treatment is long continued these exposed surfaces are bathed in pus and may not regain a comfortable condition on account of destruction of the pericemental tissues. The nerves and blood vessels entering the teeth—if the teeth are vital—will also be injured, and the teeth be devitalized when devitalization is not contemplated.

The foregoing objections are all obviated by opening into the sinus

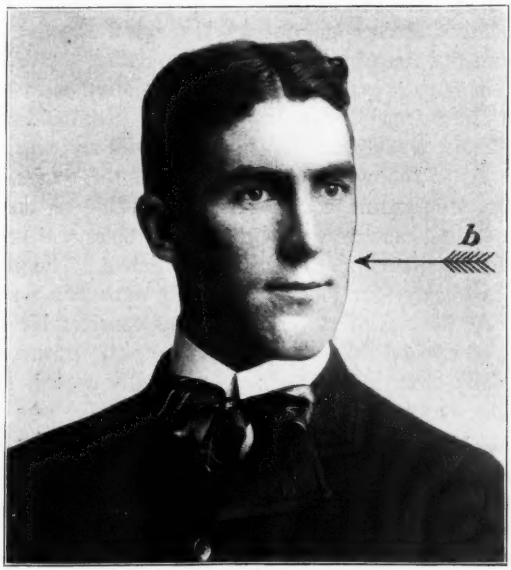
through the alveolar process from the socket of the tooth which examination determines is at the lowest level of the antrum. Notwithstanding adverse opinions upon the subject, clinical experience, as well as diligent inquiry for many years among surgeons, convinces me that inflammation of the antrum is very rarely met with as an idiopathic affection, but occurs as the result of injury, or as an extension from a diseased tooth, the tooth involved being usually the first molar, though an abscess on the bicuspids or second molar may frequently cause the irritation.

It is surely surgical sense and pathologic science to remove the abscessed tooth which causes the trouble, be it either of the teeth mentioned, and gain entrance to the maxillary sinus at that point. The diseased root may not be exactly at the lowest level, but the opening can usually be extended so as to reach that point, and it will certainly be nearer the lower level than any opening that could be made on the external wall, and will afford the most continuous drainage possible.

I will then lay down the following propositions—First, that in disease of the antrum from dental irritation the entrance to the sinus should be through the alveolus, and if possible through the socket of the affected tooth. Second, any considerable disease of the sinus from irritation other than dental is of rare occurrence. Third, if sarcoma is found in the antrum, whether from dental, traumatic, catarrhal or idiopathic irritation, the opening through the alveolar process is demanded by the best surgical science, even if a perfectly sound and useful tooth is sacrificed, because such an opening affords ready access. Continuous drainage does away with the necessity for drainage tubes, tents or stoppers. Fourth, when the disease abates the opening readily closes with new bone and leaves no objectionable cicatrix which may show a blemish on the facial contour. I have on more than one occasion found the external opening failing in effecting a cure which the lower opening through the alveolar process corrected, and also found the former presenting one or more of the aforesaid four objections.

I consider myself especially fortunate in being able to present to you the history of a recent case practically demonstrating the claims I have made as to the inadequacy of the external opening, and showing you a photograph of the patient with an objectionable depression in the natural contour of the face, as the result of such an open-

ing—certainly more objectionable than the loss of even a sound tooth. The history of the case is as follows: The patient, aged 22, from the age of 12 had trouble with decayed left superior first molar, inflammation and swelling, reaching the climax about twice each year, when the trouble would subside; noticed fetid discharge from left nostril, which was thought to be catarrh and treated as such. At the age of 18 visited a dentist who extracted the diseased molar,



b.—DEFECTIVE CONTOUR FROM OPERATION.

which gave relief for a short time only. Then went to another dentist, who removed a root left by the first operator. The trouble continued and a third dentist was consulted, who diagnosed inflammation of antrum, and an opening was made. Treatment was by syringing with antiseptics and placing a drainage tube. Patient was treated nearly every day for six months, and tube was removed once a month. Disease continued about the same, so he visited a fourth dentist, who enlarged the opening and treated twice a week for seven months, discharge still continuing. Patient then went to a surgeon,

who made an opening on the external wall, and after treatment, packing with iodoform gauze, there was no permanent result, the offensive discharge returning when treatment was discontinued. The patient then returned to the dentist to whom he had first applied for relief, and was directed to me.

I found the opening upon the external wall closed with repair tissue—no bone, and leaving a depression; a small opening into the antrum through the socket of the molar extracted, through which pus escaped, and a free discharge of pus from the nostril on left side. I enlarged the original opening through the tooth socket until it was about five lines in diameter. Examination showed the sinus filled with a fibrous growth, which was removed with curets and irrigation. In the operation a drainage tube which had been used by the third dentist was dislodged. It was of quill and was very foul-smelling. After thoroughly removing all of the tumor, irrigating with water, temperature 120 degrees, and using as an antiseptic Dobell's solution, cauterization with pure carbolic acid and packing with iodoform gauze completed the first treatment. The packing was removed in twenty-four hours, then daily antiseptic washing was kept up. At the end of a week there was considerable unpleasant discharge, so applied full strength iodin over all antrum walls, and renewed daily cleansing. Discharge gradually ceased, and at the end of eight weeks entirely stopped. The operation was performed Jan. 16, 1902. The discharge from the nose is gone, the discomfort has ceased, and the opening, which during all the treatment remained open, has entirely closed.

As the main object of the presentation has been an argument against penetrating the antrum from the external wall over the buccal roots of the teeth, I will conclude by noting two points against such operation which the case presents. First, the external opening made by the surgeon, although evidently a considerable one, did not effect a cure, even with the offending tooth long out of the way, nor even betray the presence of a poisonous drainage tube. Second, the external opening has left a facial blemish, owing to the fact that the bone has not reformed, and the cicatricial tissue shows a depression noticeable upon the cheek. Severing the attachment of muscles mentioned may also have contributed to the objectionable result—a result, as I have said, which will not follow the loss of a tooth, even if it must be sacrificed in the operation.

Discussion. *Dr. M. L. Rhein,* New York: I believe it is impossible to handle this subject as suggested by the essayist, and the pathological conditions present in the maxillary sinus are so different in their etiological factors and in the shapes that present themselves to us that it is impossible to outline a uniform course of treatment. The varying conditions must govern the method. The case which Dr. Patterson has cited is an argument against the form of treatment which he suggests. The fact that the surgeon who operated on the external plate of the antrum failed to find the quill that was lodged therein, and was unable to remove the pathological conditions present, is no argument against the fact that the operation was the proper one at that time, but merely shows that a poor operation was performed by an incompetent operator. I cannot see how Dr. Patterson could have removed the quill, and pursued the course of treatment by means of which he cured the case, unless that portion of the external plate had been previously removed and he were able to utilize the space in removing these pathological conditions. I do not believe a radical operation for a serious condition in the maxillary sinus can be performed through the limited space afforded by the socket of a tooth. The pathological conditions found in the antrum may be divided into two general classes—acute and occurring for the first time, or chronic. In an acute condition, with the infection recent, radical operative intervention is frequently uncalled for and unnecessary, for in a large number of these cases treatment can be made through the nasal canal or irrigation through the socket of a tooth where the opening into the antrum is sufficient, and a cure be effected in that way. However, where there is a tumor, or polypoid growth, or some condition necessitating thorough curetment of the entire antrum, it seems to me impossible to effect a cure unless the whole of the antral cavity is laid bare.

Dr. W. H. G. Logan, Chicago: This paper is in direct opposition to the method set forth by me at the last annual meeting. My belief held at that time has not been changed by observation, so I must disagree with the essayist. The first objection made to the buccal opening is that the perfect drainage sought is not obtained. If the buccal opening is made we are in position to explore the antrum and ascertain if the penetration is made into the sinus, a condition that sometimes cannot be determined through an opening from the alveolar process. This is proven, not by my statements, but by the casts and

charts shown by Dr. Cryer in years past. The next step is to carry the opening to the lowest point of the antrum, and thorough drainage is then obtained.

To take up the second criticism, that an objectionable cicatrix of soft tissue frequently results over the buccal opening, I would say that the size of the ordinary buccal opening in the soft tissue is not greater than the aperture produced through the mucous membrane and tissue by the removal of a first molar. Furthermore, both openings close by the same process—of granulation, and the tissues are practically the same, mucous, because we have not gone into the fibrous mass of the muscles.

The third objection is that the origin of the masseter muscle and the attachment of the buccinator are sometimes seriously impaired. Eckley says—"The masseter muscle. Divisions: Superficial and deep layers. Origin: Superficial layer; lower border malar bone and anterior two-thirds of lower border of zygomatic arch." In other words, we reach the superficial but not the deep fibers. "The buccinator arises from (1) the pterygomaxillary ligament; (2) from the alveolus of the upper jaw; (3) from the alveolus of the lower jaw." We have made our opening above the alveolar process —draw your own conclusions.

In reply to the fourth objection I would say, carry the opening forward or backward and obviate the possibility of exposing the molar roots.

I entirely agree that the majority of cases which present themselves for treatment are of long standing, and that from the constant discharge from this sinus into the nasal fossa result the polypoid growths so often present. The nasal fossa has free exits for its secretions, and if a discharge of pus into it results in the proliferation of that tissue, should we not expect to find the polypoid growths from the mucous tissue lining the antrum growing more profusely, since the pus is more constantly present and the irritation is more persistent. Clinical observation proves that when the mucous membrane of this sinus has been subjected to the irritation of suppurative and necrotic bacteria for a number of weeks, mucous tissue development in the form of polypi is a natural result. Irrigation of the antrum will reduce the size of these growths but not remove them, and so long as they remain the sinus cannot return to a normal condition. Permanent cure depends largely upon the removal of all

carious bone and polypoid growths by curetment, and without it treatment cannot be thoroughly carried on. Furthermore, to know that cavity thoroughly an ocular examination should be made through the buccal opening. Finally, if sarcoma involves the maxillary bone or antrum, remove the floor and facial portion of the sinus and almost all the maxillary bone, or you will not permanently aid your patient.

Dr. R. H. Hofheinz, Rochester: One statement of Dr. Patterson's largely justifies his opinion. If I am not mistaken he said that most antral trouble was due to the teeth, and I believe that where they have caused the disturbance it is almost invariably necessary to remove the offending members, because the trouble has been of sufficiently long standing that the necrosed roots penetrate the antrum, necessitating extraction. Probably this is the main reason why Dr. Patterson advocates extraction as the best method of curing these troubles. On the other hand, during the last few years we have all observed many cases of irritation of the antrum and other sinuses as the result of the grip. Frequently antral trouble continues after the grip germs have disappeared, owing to their ptomaines remaining. Under such circumstances, where dental trouble has probably had nothing to do with the production of the irritation, would not Dr. Patterson prefer to make his buccal opening rather than to extract a tooth—at least until he has definitely decided that he is unable to effect a cure without extraction?

Dr. Thos. L. Gilmer, Chicago: The character of the operation depends entirely upon the condition present. If we have an empyema of the maxillary sinus that is caused by the septic roots of a tooth, perhaps extraction of the tooth is all that is necessary. If we have a simple engorgement which has come as a sequella to the grip, or has perhaps been transmitted through continuity of tissue from an inflamed lining of the nose to the sinus, an opening large enough to give drainage may be all that is necessary. But if we have a prolonged empyema, which is dependent upon a general diseased condition of almost the entire lining of the wall of the sinus, extraction of a tooth or a small opening through the socket is not sufficient. If there is trouble present that cannot be cured by ordinary irrigation and slight drainage, we should have an opening sufficiently large to admit the small finger, so as to obtain the benefit of the tactile sense, and large enough that we may introduce a small electric

lamp to illuminate the cavity and show its condition as treatment progresses. These aids cannot be employed in conjunction with Dr. Patterson's method, and it is impossible to curet the entire antrum with the smaller opening. It is often necessary to remove the entire lining of the walls of the antrum to effect a cure. To enter the cavity by an opening through the alveolar process, if it is made large enough for curetment, entails cutting an immense amount of the process, and is much more destructive of bone than is necessary or is occasioned if the opening be made in another way. If the patient is somewhat along in life the buccal wall of the antrum is quite thin, but at any age it is easily penetrated from this direction and in the most dependent portion of the sinus.

Another objection I would urge against the opening suggested by the essayist is the liability of food being forced into the cavity in mastication. If the opening be made on the buccal side the cheek folds over it and makes a cover which in a measure prevents the entrance of food. As to the disfigurement, I have performed the radical operation—making a large opening through the buccal wall of the cavity—very often, and have never seen a case where deformity resulted. I am therefore led to suppose that the case reported by Dr. Patterson is exceptional. Possibly the surgeon made the opening from the exterior of the face, and if so we should expect a deformity.

I do not make the opening in such a way as to interfere with the buccinator muscle. I make a horizontal incision at the duplicature of the mucous membrane and the gum, then, using a periosteotome, the soft tissues are dissected from the bone and held up out of the way in such manner that the muscle is not materially injured and certainly is not destroyed. I begin the opening with a large drill very near the alveolar process, cutting upwards, and then enlarge with cross-cut burs, mesially, distally and upwards, sufficiently to get at the cavity in such manner that I can see into it or feel it, and thus know its condition.

Dr. T. W. Brophy, Chicago: I would not remove a tooth to secure drainage unless it were absolutely necessary to do so, as that tooth may give good service many years after complicated disease of the antrum has been cured. In recent acute cases of abscess of the antrum I have frequently perforated the wall with a very fine spear-shaped drill, carrying it through the nasal passage, and in a week

the trouble would be ended. However, I would not advocate that generally, any more than I would always recommend removal of a tooth or an external opening through the buccal wall. The conditions present in each case must guide us. The X-ray does not help us in determining whether there are polypoids, carcinoma or anything of that nature in the antrum, so in severe cases we not only obtain the proper drainage but can also make an ocular and tactile examination through the buccal opening. We may have other complications that have not been mentioned, as the frontal sinus, infundibulum, ethmoidal cells, etc., may be involved, and we cannot hope to cure the majority of these cases through a tooth-socket. Some patients have been cured through tooth-sockets, and many others have suffered with antral disease for years, carrying a drainage tube and having the cavity irrigated several times a week, but all to no purpose.

Dr. J. Y. Crawford, Nashville: Take a case where a tooth pulp has been devitalized and an abscess forms and discharges into the antrum. There is merely a discharge of pus and a slight disturbance of the mucous membrane—a simple empyema, without foreign growths or any other complications. The infection will subside the moment the cause is withdrawn. In such a case I feel sure Dr. Patterson would recommend the buccal opening. I am satisfied that many antrums have been opened, explored, cureted and treated, that never got well and never will get well, where a cure might easily have been effected if such radical measures had not been adopted. Where the mucous membrane is very sensitive the daily syringing frequently tears down all that nature has accomplished. The antrum is more often over than under-treated.

Dr. G. V. I. Brown, Milwaukee: In justice to Dr. Logan I would say that the case he operated on in Milwaukee last year recovered without any deformity of the face. The patient was under my care, so I am able to bear this testimony.

Dr. B. G. Maercklein, Milwaukee: The dentists and the surgeon who preceded Dr. Patterson absolutely failed to remove the cause of the trouble, so they had no right to expect any results. Dr. Patterson simply removed everything that caused the condition, and of course effected a cure.

As regards openings remaining after the operation, I have never been unable to close them, and in one edentulous case, where the

opening was nearly two inches long, I closed it after eighteen months of constant stimulating treatment.

Dr. C. P. Pruyn, Chicago: Because in one case the opening into the antrum was made through the buccal wall and depression of the face resulted, Dr. Patterson advises us never to make such an opening, or the symmetry of the face will be lost. I think he goes altogether too far in his advice. In the case cited he states that the trouble began at twelve years of age. Now, we all know that the antrum, as well as other facial sinuses, is just developing at that age, so the real cause of the facial depression was not the opening through the buccal wall, but the arrested development of that side of the face, owing to the serious alveolar abscess. I have made a great many openings through the buccal wall into the antrum, and have never seen any perceptible sinking of the features or tendency toward asymmetry resulting therefrom.

Dr. Patterson, closing discussion: I have treated a great many cases in the last thirty-five years and have never been called upon to penetrate the antrum for any trouble like the grip, or for any idiopathic affection. In a case such as Dr. Hofheinz described, if the teeth were sound, I would treat from the nasal opening, or make a slight opening externally, but that is different from a large external opening.

PROGRESSIVE UNILATERAL FACIAL ATROPHY.

BY E. P. DAMERON, D.D.S., ST. LOUIS. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, MAY 21-23, 1902.

Definition.—This disease, a most remarkable affection—also known as facial hemiatrophy, facial trophoneurosis (Romberg), neurotic atrophy of the face (Virchow), laminar aplasia (Lande) and prosopodismorphia (Bergson)—is characterized by progressive wasting of the bone, fat, connective tissue, skin, and in rare cases muscles, of one side of the face, without great impairment of cutaneous sensibility or loss of motion and expression.

History and Literature.—Eulenberg in a chapter on this disease gives it a most excellent description, especially valuable for reference as to the various theories as to its nature. According to him, the disease has been known to the medical profession since 1825,

when it was first described by Parry. Carswell first scientifically classified the various lesions which might arise from retarding, arresting or inverting action in nutrition. According to Mills, Romberg called general attention to the disease in 1846, and took the position that it was a primary trophoneurosis. Of American writers, Bannister is probably the most complete and valuable. He reports fully and carefully two cases and gives a thorough discussion of special symptoms and pathology of the disease. Mills gives one personal case in detail, and further says that out of twenty-five cases classified by him, nine were men and sixteen women, and the following were the ages: Under 10 years, seven; from 10 to 20 years, eleven; from 20 to 30 years, six; over 30 years, one. Knowledge regarding the causes of this strange disease is in a very imperfect condition. The following facts have, however, been observed: The affection is not hereditary; it occurs most frequently in childhood and early adult life; more females than males are attacked; the left side of the face is affected more frequently than the right; it is essentially chronic, cases having been observed for many years in succession.

The affection could be traced to injury in a fair number of cases, one of which followed a fracture of the lower jaw; another case had suffered repeatedly from frost-bites; in yet another case, which was apparently a typical one of unilateral facial atrophy, no history of traumatism was present. In discussing the probable cause of impairment of taste in each of his cases Bannister says: "The atrophy seemed to involve the region supplied by the second division of the fifth nerve as much as or more than the other divisions; and on this is situated the spheno-palatine ganglion, which gives off the Vidian nerve, the upper division of which—the superficial petrosal nerve, according to Schiff—contains the taste-fibers."

According to Mills, the usual theory of this disease is that it depends upon an affection of the trophic-fibers contained in the fifth nerve or one or more of its divisions. He also states that Baerwinkle, who accepted this theory, noticed a case of unilateral atrophy of the face which affected only the second division (superior maxillary) of the fifth nerve, and, as he held, indicated trouble with the spheno-palatine ganglion, its trophic center. He, however, takes issue with Schiff as to the course of the taste-fibers. Most authorities considered the affection to be of neurotic origin—at the same time differ-

ing widely in their views. One writer considered it a form of progressive muscular atrophy attacking the muscles supplied by the portio dura; now known to be a mistaken idea. Another regarded it as due to continued irritation by some long-standing disorder of the cervical sympathetic. "The irritation of such a lesion causing vascular spasms, diminishing the blood supply and leading to a gradual development of atrophy." This theory seems incomplete, inasmuch as there is apparently more than a diminution of nutrition; there is, rather, a wasting condition, a perversion of nutrition. Lande termed the affection laminar aplasia, and held that it originated in the connective tissue and affected the nutrition of the adjoining parts by retarding the circulation. Perhaps the most tenable of theories is that advanced by Virchow, who holds that the affection is of peripheral and not central origin. According to Mills, he believes "that a primary process, once set up in the nerve-trunks owing to inflammations of the surrounding tissue, may then extend upward to the spinal and basal ganglia." Based upon clinical observations and facts, the theory of trophoneurosis is perhaps best established. A personal case I shall presently give you was undoubtedly of such origin. For the sake of convenience, symptomatology and diagnosis will be considered jointly.

The beginning of unilateral facial atrophy is usually marked by the appearance of a persistent whitish patch upon the skin of the cheek, which gradually becomes paler, and the skin becomes smoother and thinner and more depressed than the adjoining tissues, continuing very gradually and evenly in all directions until the face becomes much sunken in, the teeth loosen and drop out, and the beard or hair of the affected side changes color, falls out or ceases to grow. The skin becomes mottled and appears to be closely attached to the bone, fat, connective tissue, and even bone and muscle disappear, giving the face an aged appearance on the affected side. Attending the atrophy are neuralgia, tingling, stinging sensation, slight numbness at times, and other sensory phenomena. These usually precede, rather than accompany, the affection. In nearly every case there is almost complete absence of perspiration (anidrosis) on the affected side of the face. In a case reported by Bannister the first molar occasionally ached, and the gingivæ and alveolus were so wasted as to expose its roots for a considerable distance; while the falling out of the teeth is cited in

several other cases. Close comparison of the two sides of the face is not necessary except in the early stages of the affection; contrast between the two sides is so marked that diagnosis is readily made. Affections which resemble progressive unilateral facial atrophy at different periods are vitiligo, alopecia areata, Bell's palsy, chronic muscular atrophy, lepra, morphea, and congenital asymmetry of the face. Differential diagnosis is readily made, aided by such factors as the history of the case, absence of facial paralysis, size, location and character of the spot on the cheek, loss of sense of taste in one-half of the tip of the tongue, and deflection of the tongue and uvula. In chronic progressive muscular atrophy muscles are attacked one after another and frequently some distance apart, while in unilateral facial atrophy the wasting process spreads uniformly and regularly over one-half of the face. In the former the color and appearance of the skin is not altered, while in the latter it becomes mottled and drawn. Congenital asymmetry of the face is usually accompanied by corresponding asymmetry of other parts, and not infrequently the opposite side of the body. Bell's palsy, paralysis of the facial nerve, has in a few cases been followed by a slow, progressive deterioration—due, supposedly, to mechanical causes, as pressure exerted by contraction of the skin. However, in unilateral facial atrophy all the movements of the mouth are possible; the eye can be closed, the forehead wrinkled—in fact, there is no true paralysis; while the reverse is true of Bell's palsy, as is well known. Hypertrophy of the opposite side of the face is usually present. Authors differ as to this, however. The general health of the patient is not affected by the disease. Prognosis as to recovery is not promising. Dercum (1) says: "Recovery does not take place. The only hope of the patient is that the process may be spontaneously arrested." The disease has been known to remain dormant or stationary, but no authentic case of cure has been established. There appears to be no well-defined treatment for the affection other than that of building up the nerve centers by such medicinal agents as preparations of arsenic, strychnia, iron, and the salts of gold, silver, copper and zinc, accompanied with electricity or carefully administered massage. According to Dercum, interruption of communication between the trophic center of the nerve and its distribution is indicated, and he proposes resection of the different branches of the trifacial, saying: "Should the ex-

pedient fail and the disease prove to be due to some affection of the peripheral endings, little or no harm would have been done." There should be no hesitancy in attempting any treatment possible for the relief of this distressing and disfiguring affection.

Case 1. I will now briefly give the notes on a case which has been in my charge during the past three years. Miss M., aged 25, nervo-sanguineous temperament, family history good, came to the office April 10, 1899, for consultation regarding neuralgia and the wasted appearance of the left side of the face, stating she thought the trouble to be in the superior first molar of that side. Upon examination the tooth was found to have been devitalized, and contained a good-sized amalgam filling, but was apparently in a healthy condition otherwise, having been so since her 14th year. Proceeding with the examination, considerable swelling was discovered just posterior to the second molar, there being no third molar present. This swelling extended well over on the palate, and the slightest pressure caused the patient considerable pain. This condition had existed for about three years, as well as she could remember, and at the same time her face had been growing thinner on that side and apparently fuller on the other. The teeth on the left side of the inferior maxilla were found to be in good condition with the exception of a small cavity in the left second molar. (This was immediately filled, and has since occasioned no discomfort.) The first molar had been extracted several years previously. The tongue was slightly atrophied in the region of the bicuspids. There was also a slight nasal catarrh. On the face, just below the molar prominence, was a whitish spot about the size of a silver twenty-five-cent piece, which was considerably depressed; several other mottled patches were noticable on the cheek. The skin was thin, slick and tightly drawn. The lips closed normally, but when smiling or talking the left side of the mouth became elevated and drawn to that side. The left anterior branch of the temporal vein showed plainly and appeared to be considerably enlarged. The hair, eyebrows and eyelashes on the affected side were thinner and lighter in color than on the opposite side, and came out easily. There was also complete absence of perspiration on the left side of the face—in fact, a typical case of progressive unilateral facial atrophy. The diagnosis of facial paralysis had previously been made and accordingly treated, without

favorable results. The essayist concurred in this diagnosis, but later, noticing such tangible differences from Bell's palsy, decided it to be an atrophic condition. The swelling in the region of the left maxillary tuberosity was thought to be caused by an impacted third molar. The gum was anesthetized, an incision made along the crest of the alveolus extending from the second molar posteriorly to just beyond the tuberosity, the offending tooth found and removed. The wound healed normally. A tonic was given, and hot application to the affected part, followed by massage and sponging with alcohol daily, was the treatment. This was continued for about twelve months, at the expiration of which time some slight improvement was apparent. The color of the skin was good. The enlarged temporal vein had been considerably diminished. The hair stopped falling out and was of nearly normal color. A slight degree of perspiration was noticeable. The hypertrophied condition of the opposite side was considerably abated. The wasting process had evidently been checked. Have seen the patient frequently since, and there is no evidence of recurring atrophy. The sunken condition of that side of the face remains—due in part, no doubt, to the diminished size of the bone; but the general appearance is so improved as to be very gratifying to the patient.

Case 2. One other case of unilateral facial atrophy came under the observation of the essayist, but was not treated by him. Mrs. F., age about 34, bilio-lymphatic temperament, family history good, about her 23d year began to be troubled with neuralgia of the left half of the face, and about a year later noticed a white spot on the cheek. The disease progressed slowly until her face became much wasted on that side. Her upper teeth, becoming loosened and much decayed, were in her 29th year all extracted and an artificial denture supplied. The lower teeth were in fair condition—several, however, having been extracted. Cessation of neuralgia and neurotic phenomena followed the removal of the teeth, and the progress of the atrophy was apparently arrested, the patient being unable to detect any change after that event, five years having elapsed.

In conclusion: The majority of writers believe unilateral facial atrophy to be due to some disturbance in the trifacial nerve; and Bannister specifies the second division as the seat of primary origin, and in one of the cases reported by him attention is called to the occasional aching of the superior first molar on the affected side.

Loss of the teeth is cited in several cases. The affection occurs in childhood or early adult life—periods of life when it is most natural to expect dental disturbances. In the two cases observed by the essayist the affection was arrested by the removal of the teeth. Little attention was given by most of the writers to the condition of the teeth, other than to say they usually loosen and drop out. Other theories as to the cause having proven more or less erroneous, it may not now be amiss to study the affection from this standpoint: Atrophy having its origin in some dental disorder. Should this hypothesis prove to be the correct one, and the true etiology and therapy established, it would be another step onward in the march of progress, hailed with joy and gratitude by the sufferers of this strange affection.

SOME THOUGHTS ON THE SO-CALLED "PRELIMINARY REQUIREMENTS."

BY ANDREW J. FLANAGAN, D.D.S., SPRINGFIELD, MASS. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

For some years there has been a seeming unrest in educational matters of all kinds, and this may well be considered from many points of reasoning as being simply in harmony with the world's evolution in general—an evolution which has progressed from the beginning and which we may well hope is to continue for all time. This evolution of educational thought and method must necessarily have a cause, and the discovery of a cause is the beginning of a rational and logical system of betterment. Time was when education concerned but a fraction of this world's population, for we were then in what might well be termed the constructive or bare living stage, but as changing conditions brought us up from this period we had the time and means for something beyond a mere existence. The older countries have been beyond this mere existence stage for some time, but we here in America are only emerging from it, yet coming forth in such strength and numbers that the world stands aghast at the shadow cast before. America to-day is the center of the greatest interest in all that which may be classed under educational advancement for a specific purpose. The present sees us tak-

ing the fundamentals of the past and present of the old world's brightest minds and transplanting them into an entirely new environment, with results that other countries are beginning to admit if they do not understand. In a broad sense we can divide educational thought into two fields: 1st. That which is represented by the United States; 2d. All outside the United States. Of course, in a strict sense objections can be made to this division, but in a general way it will stand the test. The one great cause for this division is, that all that which makes up our system of government is arrayed in a general way against the many systems outside this country.

Dentistry has been keeping apace with the world's advancement along the lines of education, and this progression has brought forth varying ideas, methods and results. At the present time we may say that we are coming forth from the period of construction and recognition into the broader and no less important one of system and science. This has not been accomplished without many misgivings as to results, and even the present attainments of dentistry are questioned by not a few. The logical mind must, however, admit one great truth, namely, that we have arrived at our present condition because of our own labor and inherent worth. We have borrowed many ideas and thoughts from other callings, and yet have founded a new one, which, in its broadest and best sense, is the equal of any in the alleviation of humanity's ills. Is not our use to humanity the only true guiding star for the future? In fact, will not the lasting history of dentistry depend on it? If we admit these truths we have a path of progress which is blazed in no uncertain manner—a progress which will bring forth the only lasting attention of the world—for the needs of humanity and science.

The foundation of education in our calling has been said to be our "preliminary education." An understanding of the word preliminary would indicate that it was something which leads up to the calling of dentistry, or which is, in other words, the primary part of dentistry. A logician would say it was the cellar on which was erected the main structure. Thoughtful men are questioning the worth of the present preliminary requirements to the college life; there is even a class of practitioners who question the methods of teaching in some of our colleges, and not a few do not believe in four terms. Four terms are frequently erroneously expressed as four years. These men are at least honest in their convictions. Let

us reason a little. The various acceptable colleges are supposed at the present time to have as a requirement a minimum preliminary education equal to two years in high school. This is a very elastic standard. Does any intelligent man think that all high schools give an equal training? If he does I will refer him to the latest report of the Commissioner of Education. There are high schools in this country where two years' work counts for no more than graduation from some first-class grammar school. There are students who will matriculate at some of these easy schools, and after passing their freshman year will matriculate at a good college requiring an honest preliminary standard. This latter school accepts them in the second year without a preliminary examination. Thus are the honest colleges cheated. Educators of first rank in other callings long ago dropped the certificate business and put each prospective student through an honest examination. Gentlemen, let us cease being hypocrites and come to the only safe preliminary requirement—examination. If we continue as in the past many of our schools will profit over honest ones to the detriment of dentistry. More could be written about the shortcomings of our educational system but time forbids. However, if any have doubts as to the truth of my statements, let them interview members of some of those state dental boards requiring a high grade written examination. An oral examination is not always a criterion for an ordinary knowledge of English, but a written one is frequently so.

Suppose in time we admit our preliminary requirements are not up to the proper standard, and we either require a diploma from the highest grade high school or give an examination equal to it, will that be for the best interests of our calling? Or suppose we go farther and require an A.M. or an A.B. degree. Will the possession of these degrees best conserve the future of dental education? There exists a grave doubt in my mind. Let us again do a little reasoning.

Previous to about 1820 it was a common belief that education was to be derived solely from the systems of the so-called schools and colleges, and unless a man followed literature, statesmanship, law or medicine he could not class himself as belonging to the educated people. Indeed, many did not class medicine as the equal of the others. Froebel, the educational reformer, was born in 1782, and in 1826 produced the great work entitled, "The Education of Man." He brought out many other writings along the lines of the kinder-

garten system; but this great work of 1826 brought about a revolution in educational work, especially in Germany, Great Britain and the United States. He died in 1852, but not before he had seen his educational reform work an accepted truth. Spencer in 1861 produced his work on "Education" and paved the way for a rational education. La Conte, Tyndall, Quick, Haeckel, Painter, Bain and many others have followed along similar lines. The time is now passed when the training of the mind alone constitutes education in its best form. To be sure, there are people in the so-called higher (?) society of the world who consider the use of the hands in life work as not only a low form of education but also as ungentlemanly. The older days of dentistry produced a practitioner second to none in technical ability. And why? Many started young to learn mechanics of some kind and drifted into dentistry, while others served a long apprenticeship under a good instructor. In the words of Dr. C. T. Stockwell of Springfield, Mass., "The laboratory was his throne and his college; and here he toiled faithfully and well, and wrought out the very foundation of the superstructure which we pride ourselves in calling modern dentistry."

Those old days are gone never to return, and I am optimistic enough to believe it is for the best. But is there no underlying fundamental to grasp from their past experience in dental education? Is it not this, that we must gain our technical or mechanical dexterity before entering college? If we are to produce scientific practitioners we must at the present time take up manual training in conjunction with selected studies. The United States to-day stands second to Germany in manual training ideas and facilities, and the time seems ripe for dentistry to start a course in the various public schools suitable for the higher development of the mind and hand along the lines of preliminary dental education. We have people who are color-blind and tone-deaf, and may we not safely say many are and always will be mechanically or technically "dense?" Where is the better place to discover this? Is it not in the preliminary school rather than in the college? In fact, is not the greatest need of our present educational system of dentistry some reasonable way of "dropping" these technically imperfect students?

We hear many decry the setting up of a system of dental education apart from the medical men, claiming that dentistry is a specialty of medicine, and that our calling will never be what it

should be until we have the title of M.D. Has medicine such a mortgage on the knowledge essential to our advancement that we will have to go to her to obtain it? Perhaps it is the degree and not the knowledge that is needed for our advancement. To those who think this degree is essential all respect is due, but they seem to forget that this is the age of all knowledge to the end of the best dental training. We need no extra degrees, but we do need any knowledge that will lead to higher and better dentistry. The future will surely evolve the fact that when we enter a dental college it is for a specific course, and that many of the studies we now take up in college will have been mastered in our preliminary colleges—the public common and high schools of technical training. As yet we are but on the border line of technical education, and the future will surely surprise us.

The literature pertaining to dental education has of late brought forth valuable and pointed thoughts from men teaching dentistry in our colleges, and it is easy to discern that the material furnished them is not entirely satisfactory, and that the future welfare of our calling will surely demand a change in the present so-called preliminary requirements. Have we not worshipped long enough at the altar of the "false god" of the "other fellow?" Is not the time at hand for a change?

Discussion. *Dr. G. V. I. Brown,* Milwaukee: I would correct an impression given by this paper concerning the preliminary requirements of the National Association of Dental Faculties with regard to students, which is not in accord with the present state of affairs, because such preliminary examination is now in the hands of the state superintendent or the highest authority in education in the particular state in which the college happens to be situated, and it is not in the somewhat lax condition that the paper represents it to be.

Dr. E. A. Bryant, Washington: To a great degree I concur in the ideas expounded by the essayist. The main thought of this valuable paper may be said to center in manual training as a preliminary to the study of dentistry, and to that feature I subscribe, providing the present "medico-dental" methods of teaching are to be relegated to the rear. Let me read an extract from a letter of Dr. Kirk's which was read at the last congress—"To my great surprise I have observed that the number of those who fail in their yearly examinations has increased in proportion to the increase in the entrance ex-

aminations. . . . . The students who had received their preliminary education in the manual training schools were *in every respect* better prepared to comprehend and assimilate the teachings given in professional lectures, while those students whose preliminary education had been of a purely literary nature were those whose results were least satisfactory." You will see that the views of Dr. Kirk and the essayist agree closely on this feature, but the former have the advantage of being based upon Dr. Kirk's experience as a teacher and the data collected from material under his personal observation. That data should open the eyes of those interested in the educational feature of future dentistry, and I especially commend it to those of our profession who for the past twenty years have advocated the "higher educational" theory upon which are based our present methods of teaching.

The whole subject of dental education, aside from the preliminary requirements, needs considerable attention at this time, if the turning of all that portion of that work classed as mechanical into the hands of mere mechanics and "dental laboratories" is not to be the ultimate result. Like the ophthalmologist, the future dental surgeon will write prescriptions, give measurements, and the dental laboratory "will do the rest." If present ideas and methods prevail it will not be necessary for the dentist of the future to acquire a knowledge of the mechanics of prosthetic dentistry, and the essayist points to this fact plainly. To my mind, the future of the dental profession is in more danger from its own actions in actual practice than from any lack of or addition to the preliminary education of its students. The advertising quack has been held up to the younger members of our profession as the bane of dentistry, but I firmly believe the dental laboratory, the natural sequence of the advertising "cheap John," is a far more dangerous product, inasmuch as it is supported directly by the profession whose life blood it is gradually but surely absorbing. I am not attacking the dental laboratory or the owners or members thereof, but I do enter my solemn protest against the system of teaching and actions of the leaders of our profession which produced them. We cannot lay the blame for untoward results upon the laboratory man, for we have made the field ourselves, and he is merely "filling a long felt want." Unlike the majority of our profession who take advantage of the present conditions, he is at least honest with his patrons.

It was the fraudulent use of the so-called laboratory assistant by our leading men in the past which opened the eyes of the mercenary, produced the advertisers, and drove the dental apprentice out of existence. The apparent success of this new product, working in conjunction with a lack of mechanical training of dental students, has brought forth the dental laboratory, which will provide a first-class graveyard for the interment of the dental profession if it will only lend its aid to the "hari kari" long enough. There is no use dodging the issue. In the success of the dental laboratory the only logical result is the death of the profession which makes such things possible, or a new system of education along the line of the ophthalmologist, with practice under like conditions. Our present medico-dental teachings are assisting materially in this direction, and while a preliminary on the lines of mechanical training may be able to retard such a result somewhat, an entire change in our educational system and a return to personal work in personal practice will be found the surest method of correcting present evils.

SOME PATHOLOGICAL CHANGES IN TISSUE.

BY G. W. COOK, D.D.S., CHICAGO. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, MAY 21-23, 1902.

The adaptive, protective and reparative tendency is common to all living organisms when placed in unnatural environments (adaptive and protective), when in contact with poisonous agencies; or when injured (reparative). Here we shall consider only infective inflammation or the poisonous effects of certain bacteria and their products upon tissue; and the protective reaction of tissue against these agencies.

The influence of bacterial toxins on tissue is indicated in at least three changes: first, retrogressive or degenerative; second, proliferative or regenerative; third, complete death or necrotic changes. In local disease-processes due to infection these three changes are more or less intimately associated together. In fact, it is wholly impossible to draw any definite line of demarcation. Such a thing might be possible if we could observe the changes in a single individual cell.

In the first place, all toxins are, within certain limits, irritants or tissue stimulants; that is, they cause an increased activity on the part of the affected cell, which if long continued may result in cell-

proliferation, as in the case of formation of callouses on the feet or hands due to friction. This is a transition of the epithelial tissue into a hard, horny substance, and is one of the so-called tissue-degenerations. We find a similar state of affairs in various organs of the body. If toxic substances are permitted to enter the body for a long time they are liable to set up a mild irritation of the kidneys which, if permitted to continue, may cause a tissue-proliferation, the result of which is the so-called fibrous degeneration, as seen in interstitial nephritis or sclerotic liver. These conditions are especially met with in the excretory organs of the body—as the kidneys; or in the organs which form certain secretions, as the liver. These organs have an especially large blood supply, so that any poison existing in the blood has a double action on them as compared with other organs.

But we are especially interested in certain bacterial toxins of sufficient intensity to cause local disturbances. Here we may have regeneration, degeneration and necrosis going on hand in hand. To begin with, the tissues must come in contact with a poison, the primary reaction being that of increased irritability, the increased activity of the affected tissue being of a protective tendency. Such poisons are always positive chemotaxics to the circulating cells. This gives rise to the so-called inflammatory phenomenon—viz., a gathering of the leucocytes and tissue-cells to the affected area or towards the affecting agent. On the theory of positive chemotaxis we can explain all the changes in the circulation of the blood and fluids of the body regarding offending agents—viz., increased circulation towards the part, the passing of the leucocytes through the walls of the vessels, and the increased proliferation of the final tissue-cells.

If the offending agent is not of sufficient strength to destroy these tissue elements as fast as they accumulate, the agent is soon destroyed or rendered ineffective. Here the internal resistance is greater than the external cause. In this instance the inflammatory process goes on farther than that of protection; there is no degeneration nor necrosis. Increase the power of the offending agent, and a very mixed-up condition of affairs takes place. Now, in spite of the increase in cellular elements towards the agent, they are not able to destroy it, but in turn are destroyed themselves by the poison. Here we will have tissue-infiltration in the *tethered* leucocytes; and tissue-cells begin to break up and the affected tissue becomes full of a mass

of dead cells. Those cells nearest the center of the affected area completely break up into a mass of nuclei suspended in a serum. This forms pus, and, together with the dead tissue-cells, forms a dead or necrotic area. The passing of the living cells to dead cells is not a process of necrosis, but of necrobiosis. The mass of dead cells is necrotic tissue. Then necrosis is not a process, but the result of the process of necrobiosis. There are no life phenomena, inflammatory or otherwise, in necrosed tissue.

Inflammation is characteristic of living tissue only. While the cells may be overcome by the poison and the area become necrotic tissue, around the edge of the necrosed tissue two processes are going on—protective and reparative. The cells are striving to prevent further invasion of the offending agent, and the fixed tissue-cells are striving to repair the damage already done. Here all the tissue powers are called into action, and as a general rule the tissue is able to protect itself against further destruction. It must be remembered that, especially regarding hard tissue, as bone, etc., infective inflammatory processes are the same as in the soft tissue.

If the deleterious infective agent be strong enough to destroy the life of a considerable area of the bone tissue, the part becomes *necrosed* and no life phenomena are shown. At the edge of the dead part inflammatory action of a protective and reparative nature is going on. On the other hand, if the infective agent is only strong enough to destroy cell by cell every particle of the bone tissue entering into the inflammatory reaction, caries of the bone is the result. This is well illustrated in the formation of cavities in teeth.

Another inflammatory process seen in the teeth is that of pyorrhea alveolaris. This is an infective inflammation, involving the peridental membrane and the adjacent tissue. All infective bacteria have more or less a catalytic or fermentative action on the affected tissue. In this disease the tissue-cells are gradually destroyed with pus-formation, the reparative and defensive powers of the tissue are not as great as the offending agent, and cellular destruction is the result. Here the tissues are bathed in saliva, which is a mucoid solution of inorganic salts. These salts are partially dissociated by the unbalancing of the normal electrical energy of the tissue by the injury, and are deposited in the form of calculi in the adjacent hard parts, forming the pyorrhea deposits.

In pyorrhea alveolaris in man and many similar diseases in the

lower animals, such as those affecting the roots of the horns in cattle and the hoofs in sheep, we have examples of an infectious inflammation, following in each case a definite course and producing a definite set of pathological conditions. In these diseases the parts affected are of epithelial origin, and the tissues are of the horny or keratin type, such as is found in the nails, horns, hoofs and teeth of animals.

It is a fact, absolutely demonstrated, that these diseases in the lower animals are infectious and caused by certain specific organisms, and also from both *a priori* reasoning and from almost definite demonstrating. In the peridental membrane, where this necrobiotic process is going on, the microscope reveals the fact that the cell of the parenchyma becomes swollen and granular, the nuclei become indistinct and disappear in the granular substance, and finally the whole cell liquefies and passes into solution. This is a chemical change analogous to the action of certain acids on albuminous substance. Hardy, Matthews and Lord have shown that acid sugar, 8-10 normal aseptic acid solution, acts as follows on normal cells: first, the cell swells up and becomes more transparent and granular; second, the nucleus passes into the granular substance; third, the cells seems to pass into a semi-solution. The same phenomena are observed in the action of certain cellular toxins. It is simply a chemical action due to enzymes, the result of which is a passing of the protoplasm from the solid gelatin state to the hydro-gelatin, and finally into solution.

The pathological processes of the specific bacteria toxin on such tissue as the peridental membrane are very analogous to the action of an acid on jelly or albuminous substance. Dental caries is the enzymatic action of microorganisms dissociating the tooth structure. This is a bio-chemical action, which is an action by contact, whether it be in the gelatin or hydro-gelatin state. Other observers and I have isolated a bacterium from pyorrhea alveolaris which brings about this enzymatic action on tissue-cells in which metabolism is active, and the exigencies of nutrition are imperative. The mere presence of a bacterium does not always explain the phenomena of the process, but it does explain the specificity of the disease.

The virulent condition of the germ and the predisposition of the individual must be considered for the bacterium, nor can the individual be the true entity of the disease process. The predisposition of the individual to local infection of the oral cavity is in all prob-

ability due to some other infection, either from the alimentary canal or some fermentative process going on in the mouth which reduces the power of the tissue to form anti-bodies or antitoxin, which, according to Adami, is an inherent property of protoplasm in its reaction against offending agents. Thrush is more frequent in the oral cavity than is usually thought. It is truly a disease of the oral mucous membrane, produced by a fungus of the class of saccharomyces (ordium albicans). They are pathogenic only on certain mucous membranes, but the presence of this microorganism is necessary to bring about the local pathological lesion. I had the privilege of studying this disease in seventeen cases; eleven had only local treatment and made good recoveries; six had both local and constitutional treatment and made splendid recoveries. When this microorganism is inoculated in rabbits it causes a general mycosis of the internal organs—a not uncommon disease of the oral mucous membrane, produced by the bacillus fusiform and spirillum of Vincent. In this local pathological process two microorganisms apparently are necessary, one of which is morphologically very unstable. It is not necessary to confine these pathological processes to the animal kingdom to see that the entity of disease is not in the host, neither is it in the bacterium. For instance, the yellow disease of the hyacinths appears when the plant is growing under certain environments, but is due to a bacterium which enters the vessels of the buds and leaves, causing a parenchymatous degeneration, the same as is found in the tissues in many diseases of animals.

We have every reason to consider pyorrhea alveolaris as an infectious disease produced by a specific organism, capable of producing the characteristic pathological changes. In this class of diseases we have a right to assume that the external bacterial cause must contain sufficient energy to overcome the internal energy of the tissue, else no change could result. In other words, we may say: Whenever a specific microorganism which has the power to lead a saprophytic existence in tissues of a higher organism comes in contact with the tissues of the higher organism, two actions take place; first, the microorganism begins to grow and multiply and to elaborate its specific products; and second, the organism invaded begins to react against the offending agent, to destroy it and its products. This is what we mean by the external specific cause acting against the internal resistance of the tissues. From this course of reasoning, no

disease processes are possible where the internal energy of the tissue is greater than the external disease stimulant. In fact, inflammation, with all of its multifarious phenomena, is nothing more than the outward manifestation of the tissue energies against disease stimuli.

In pyorrhea alveolaris the disease stimulus is specific and the disease process is local. All other symptoms of a seemingly general nature are secondary, resulting from the absorption of the products of the local process. To prove this we might mention a number of instances. Take, for instance, an ordinary boil, which is a purely local disease process due to the invasion of the tissues by bacteria; but we all know that general symptoms, such as increased temperature, swelling of glands and joints, are very common, and all we have to do to relieve the general symptoms is to remove the offending bacteria and their products from the local point of eruption.

But in pyorrhea alveolaris we have a slow process going on, in which the energy of the tissue-cells is a degree less than the disease stimulus. This constitutes a subchronic disease process, in which the tissue-cells gradually die or undergo necrobiosis. The disease process gradually extends, and unless the tissue-cells are aided in their effort to protect themselves, or the bacterial poisons render the tissues immune (antitoxic) to the further action of the bacteria, the disease process will tend towards complete destruction of the affected organs.

But why such a variation in the course of disease processes, both as regards the energy of the tissue and in the strength of the disease stimuli, as is so often observed? We know from our studies of pathogenic bacteria that their power to incite disease or their ability to lead a saprophytic existence in another organism is extremely variable. We may inoculate an animal a hundred times with tubercle bacilli, and the animal never take tuberculosis and the bacilli never be able to grow and multiply in the body. But change the environment of the animal, which necessarily changes somewhat the chemistry of its tissue, and the same bacilli may readily induce tuberculosis. Take, for instance, an individual affected with tuberculosis, and give him plenty of nourishing food and place him in an atmosphere rich in oxygen, such as we have in medium-high altitudes, and the tubercle bacilli can hardly live. So we say the environment of the individual governs to a large extent the development and course of disease processes.

Likewise, we know that environment has much to do with the morphology of bacteria. In one medium they may grow as cocci, in another as short rods, and in another in a thread-like form. And as regards morphology, their power to produce their specific disease is likewise modified. Diphtheria germs grown on a certain media may be absolutely non-pathogenic, whereas the same germs grown on a different media may readily produce diphtheria. Further, a diphtheria germ which may produce the disease in one child's throat may have no effect in another child's throat; simply because the chemical conditions of the saliva in the second throat may destroy the pathogenic powers of the disease germ.

Discussion. *Dr. J. D. Patterson,* Kansas City: The only criticism I desire to make is against Dr. Cook's claim of a specific microorganism for the disease of pyorrhea alveolaris. Now there isn't any question but what in these slides that he has spoken about in pyorrhea alveolaris he has found a certain microorganism, but that it is *specific*—that it is the cause of pyorrhea alveolaris, and that is what specific means—I deny that there has been any proof up to this time. Why, the doctor acknowledges it himself in one of the last paragraphs of the paper: "Likewise we know that environment has much to do with the morphology of bacteria. In one medium they may grow as cocci, in another as short rods, and in another in a thread-like form, and as regards morphology, their power to produce their specific disease is likewise modified." Now he claims a specific microorganism for the disease of pyorrhea alveolaris, and in this concluding paragraph says that morphology can master any of a certain class of pathogenic microorganisms, and there may be one of three or four diseases resulting, depending on the environment of the microbe—what he gets and what he feeds upon. He immediately spoils his argument regarding the microorganism being specific in pyorrhea, because in pyorrhea or any pathological condition which we find in the mouth, where there is a breaking down of tissue and where there is pus, and all the various stages of such pathological conditions, we find a great many microorganisms in one stage of the disease of a certain form, depending upon their environment and what they live upon, and another form in another stage of the disease, on account of their changed environment and what they ingest and digest. There are plenty of different forms of bacteria in the general inflammatory conditions which we find in the common abscesses

—in a boil, for instance—where we have pathogenic bacteria possessing a virulence which is more than sufficient to account for all the ravages which we find in pyorrhea. When you go into the mouth, where there have been isolated by Dr. Miller about one hundred different forms of bacteria, and out of that multitude of forms and their subdivisions claim that there is a specific form for pyorrhea, because it has been found in the field of pyorrhea alveolaris, you are going beyond the facts.

There isn't any question that an enthusiast in the study of bacteriology, as Dr. Cook is, is bound to find specific microorganisms in everything on earth. Men who have for a long time been engaged in the investigation of bacteria have had much to say upon this feature of the subject. I will read what some of them say: "Those who are concerned about the microbic cause of pyorrhea have recently the following sage advice from Dr. Williams: 'The tendency with the pathologist, who is chiefly concerned to find a specific cause for his disease [pyorrhea alveolaris], to regard every separate form of microorganism which appears constant under a single method of cultivation as a distinct species, is perhaps quite natural, but there is not room enough for the truth in any theory which is not large enough to contain all the facts. The problem of pleomorphism of fungi is intimately associated with their methods of reproduction." This is what I said myself at the Milwaukee meeting: "We respectfully direct the attention of those who without any proof claim a microbic origin of this disease to the difficulties surrounding the isolation and proving of a particular microorganism as a cause of inflammatory conditions in the oral mucous membrane."

Dr. Schreier, in contradiction of the theory that there is a specific bacteria for caries of the teeth, claims and specifically says that he believes any of the many forms of microorganisms found in the mouth may in certain environment, in certain media, become the ferment which produces decay of the teeth, instead of one or two or a few forms. He says that they do, and when it is demonstrated that any of the organisms usually found in the mouth may produce caries of the teeth, so any organism usually found in pathological conditions in the oral cavity may and does produce what? Pyorrhea alveolaris. Any of the organisms which produce fermentation may, without question, produce pyorrhea by destroying the functions of the tissue where the irritation may be, through putrefaction or

fermentation. Any of these forms may—not one, not a specific form.

I hope the form of specific bacteria for pyorrhea alveolaris will be discovered, and then we will find a method of curing it. But Dr. Cook has really found no such specific form whatever, because all of these forms that he has shown are nothing more than specimens of the forms which we see in any inflammatory tract where tissue is subject to exudation, destruction of function, and breaking down or liquefaction into pus; because we find them there every time, and they are quite sufficient to cause not only pyorrhea alveolaris and alveolar abscess, but to go on poisoning and produce pyemia of the whole bodily system from the local poison in the mouth of the patient.

Dr. D. R. Stubblefield, Nashville: I rather take the position alongside of Dr. Patterson when it comes to absolute analysis, but I wish to say in defense of Dr. Cook, that whether or not he has proven beyond controversy a specific, never-failing cause for pyorrhea alveolaris matters very little at this stage of the game to us. That germ present acts or fails to act because of the presence or lack of resisting power. We know it is a fact that the microorganism may be present and yet the tissues will remain in a normal condition as far as can be perceived, and then, from some internal cause which brings about a lowered condition of the system, the healthy tissue becomes a victim to what before had been unable to harm. If an investigator has found a special germ in this particular locality, and if it is found in every case, he may begin to suspect that this is the cause which is at work; and if we can by inoculation, or transfer to issues that are inherently normal, produce the particular pathological condition, or begin to produce it, we must begin to lean to the position which Dr. Cook now takes. I have long believed that it was the personality of the individual, whether permanent or temporary, which gives effect to the cause present, and that becomes an active cause in one case which is held in absolute abeyance in another.

Dr. H. Prinz, St. Louis: The question of morphology of bacteria in the mouth seems now to present a tendency among etiologists to reduce to a large extent the number of forms which formerly had been made out in each individual. It has been shown without question, as Dr. Patterson has outlined, that we can produce caries

from a specific organism as long as that organism will produce lactic acid. Which particular organism is concerned in the matter we do not know to-day, because one or the other of certain microorganisms may appear according to the conditions that are present in the mouth. The biology of the microorganisms is not at all definitely known. The time will come when the large amount of bacteria which is now shown and classified will be reduced to one, and it will be shown that according to the conditions, and the pabulum which they receive, they are simply modified in form and adapt themselves to the surroundings. As far as the bacteriology of pyorrhea is concerned, we can produce artificial pyorrhea, as has been shown and demonstrated, by inoculating with the virus the saliva in the mouth of a dog; but we do not know which organism produces it, and therefore the etiology is not well known.

Dr. Cook: It is probably true that these morphological changes are due to the agencies Dr. Prinz spoke of—that is, the organic salts of the saliva. We know that it is necessary to have the constituents of sea-water in order to produce the sea-urchin egg. You can not produce the cell-proliferation in artificial sea-water of the sea-urchin's egg, unless you have the absolute electrolytic condition present in the natural sea-water; and that is what the saliva is; as I mentioned, it is the electrolytic media or condition in which the microorganisms exist, and the morphology is changed according to that condition of the saliva.

Now Dr. Patterson says there is a variation of forms. I showed those studies of the diphtheritic bacillus simply to show that we know we can produce time and again diphtheria in the lower animals by inoculation from cultures of this specific microorganism. We know that we can change those microorganisms, their morphology and virulency, and yet under certain circumstances they will produce the specific condition which we know as diphtheria.

As regards pyorrhea alveolaris, why does it always exist in a certain tissue, under certain circumstances, and does not exist in other tissue? We have no such condition of things as this pathological condition anywhere else. I mentioned the pathological conditions found in the lower animals, such as the dropping off of the horns of cattle, due to the microorganisms that will not act in any tissue under any circumstances unless it has the characteristic substance of the horn. If we have pyorrhea alveolaris we must have a

microorganism producing or setting up a certain inflammatory process. Other microorganisms may enter into it, just as the cruciform bacillus and others are found in consonance with certain pathological lesions, the two acting together in that case. I am sorry I did not bring out the fact that that thread-form shown on the screen—where it begins as a long thread and later breaks up into bacilli—is the germ you will always find in pyorrhea alveolaris, and it is not found in other pathologic tracts.

I merely exhibited some of these forms on the screen to show you the variations of those diphtheritic bacilli in two pathogenic conditions, and this variation of form is produced by growing in different solutions; the different solutions being produced by a change in the inorganic salts of the solution—that is all it means. In the proliferation of protoplasm we must have these inorganic salts in solution or the differentiation of the protoplasm disappears.

ROOT-CANAL FILLING.

BY B. F. ARRINGTON, D.D.S., GOLDSBORO, N. C.

In the September issue of the DIGEST I notice a paper by Dr. Beck of Chicago, entitled "Paraffin, An Ideal Material for the Filling of Root Canals," and in the closing paragraph of the discussion of the paper Dr. Beck says, "I do not claim originality in the use of paraffin, but if anyone used it previously he failed to record it, as I cannot find any record of its employment for root filling."

There was a period in the history of dentistry (forty or fifty years ago) when there were but few dental journals in existence. Then a dentist could easily keep informed of all papers and subjects of interest that were published, but for fifteen or twenty years past journals have been so numerous that it is difficult to keep pace with them, consequently many of us lose much of valuable matter that is published, and can say as Dr. Beck, "I find no record of it."

If I could spare the time to look over some stored-away journals I think I could cite Dr. Beck several papers pertaining to the subject that were published as recently as twelve or fifteen years ago. About that period and later on I experimented considerably with paraffin in root-canal filling, but was not so favorably impressed with it as with beeswax, a material I had been using successfully for more than a quarter of a century.

Dr. Beck is moving on the right line for best results in root filling, and if, after thoroughly testing the merits of paraffin, he will accept the suggestion to drop it and substitute beeswax (best quality), and change his mode of conveying to cavity and manipulating the material in root-canals, he will possibly have reached as near the zenith of perfection in root-canal filling as is attainable.

For the benefit of any it may interest I will briefly state my practice in use of beeswax for root-canal filling. It will be well, however, to first state the claim for such an operation. As I understand it, the object is to obliterate the vacuum, and to preclude if possible ingress of fluids or microbes. To do this effectually I have never in long years of experimenting found any material equal to beeswax. In properties it is all that can be desired. It is non-irritant, a non-conductor, and is non-destructible as a remedy in dental practice. Fire is the only element of destruction. No acid known to chemists nor alcohol in any way weakens its properties. If forced through the foramen at apex of canal no harmful result will follow. It can be easily and quickly applied and successfully manipulated in root-canals, and results will follow that are entirely satisfying. Before opening and treating the canals, shape and prepare the cavity in crown of tooth, wash carefully, using bulb-syringe, dry with bibulous paper, mop walls with saturated solution of silver nitrate, and dry with hot air. Then venture into pulp chamber and root-canals, treat thoroughly, and prepare for filling as can be best accomplished. If there is no disease at apex nor any trace of septic odor it is safe to fill without delay. Have all things in readiness so that there may be no hitch or confusion after commencing operation.

Prepare against moisture, dry cavity and root-canals with bibulous paper and hot air, place a pellet of wax in pulp chamber and apply a heated burnisher, size and shape to suit. The melted wax will flow readily into canals and smallest crevices. After use of burnisher to quickly melt and flow the wax, commence with drawn-temper root-canal pluggers, different sizes, using largest size first, then next size and so on, heating and reheating at every application, adding wax if necessary. If the canals are very contracted follow use of pluggers with broaches, heating frequently to make sure of forcing wax to apex. I sometimes use delicate wisps of cotton-fiber incorporated with the wax, especially when the foramen is large. Packing the fiber with heated instruments, the cotton soon becomes thoroughly

incorporated with the wax and makes a secure apex safeguard. After the canals are filled, fill pulp chamber after same order, with more of cotton-fiber, using considerable force, then with a spoon-shaped excavator remove any fragment of wax from walls of cavity, reapply nitrate of silver solution to walls, and dry with hot air. Base with sheet lead, thickness to suit, or gutta-percha, and fill as judgment directs. Such has been my practice for many years, and almost universal satisfaction to patients and operator has been the result.

NEWER DENTAL REMEDIES.

BY H. PRINZ, D.D.S., ST. LOUIS. READ BEFORE THE MISSOURI STATE DENTAL ASSOCIATION, MAY 21-23, 1902.

From the multitude of dental remedies which have appeared within the last ten years I have selected for our present consideration only a few, believing that the statement of certain positive facts concerning a few well-tried drugs will serve the purpose of this paper far better than the mere enumeration, without comment, of a large number of the newer remedial agents. Dental therapeutics is at present passing through a formative state; empiricism is largely replaced by a knowledge of physiologic action of drugs, thus expecting definite results from their application. It is only recently that this important subject of dentistry receives proper attention in our schools. The time has passed when carbolic acid or creosote, a few essential oils, arsenic, iodin and aconite, some local anesthetic, and one or two more drugs constituted the entire dental pharmacopeia. It is certainly not essential for the dentist to have an intimate knowledge of every drug in the market, but I do believe that he should possess an exact knowledge of all those drugs which he applies daily. Therapeutics and disease are so closely interwoven that I am strongly convinced of the fact that the teacher who demonstrates dental therapeutics should also hold the chair of oral pathology, and that these two branches should be linked together in the official curriculum of our dental schools. Prof. Barrett expresses himself very distinctly on this particular point, saying: "Whatever has to do with the action of drugs, whether generally or topically applied, belongs to pathological practice."

I will now try to sketch an outline of the subject. For con-

venience sake I have divided the drugs into three groups: 1. Pulp-destroyers. 2. Antiseptics. 3. Hemostatics. You will notice that I do not mention local anesthetics. This group comprises by far the largest number of the newer remedies, and for that very reason I have left it to some future consideration, as too much time would be required for only a fair treatment of this class of drugs.

I. The Pulp-Destroyers. In 1836 Dr. Shearjaskub Spooner of New York published an excellent little work entitled "Guide to Sound Teeth; or, A Popular Treatise on the Teeth." In this book Dr. Spooner recommended to the dental profession of the United States, for the first time, the use of arsenious acid for destruction of the pulp (although arsenic was utilized by dentists for centuries as a cauterant), claiming to have learned this new method from his brother, Dr. John Spooner of Montreal, Canada. Since the introduction of arsenious acid for this purpose many substitutes have been advocated, but none has so far superseded it or taken its place. Crude arsenic, known as cobalt or fly-stone, and by many other synonyms, has been much lauded by various practitioners. It contains a very uncertain amount of arsenious oxid, and has no superiority over the pure chemical; therefore it should be dispensed with.

In applying arsenical paste a few fundamental rules are of the utmost importance if we wish to obtain the best results: 1. Never apply the paste upon a highly inflamed pulp. 2. Never apply pressure in retaining the dressing. 3. If possible, apply the paste direct upon the exposed pulp. 4. Apply the smallest possible quantity. 5. In deciduous teeth and in teeth with undeveloped roots only a mild form of the paste (or, preferably, some substitute) should be employed. 6. An absolutely water-tight stopping for retaining the dressing is necessary to prevent accidental local poisoning.

Formulæ for arsenical pastes are numerous. The simpler the compound the better its action. I have found that a paste made according to this prescription gives satisfactory results:

R. Arsenious Acid.....grs. xx
Cocain hydrochl .....grs. x
Eugenol .....q. s. to make a paste.

(A small amount of coloring material, such as carmin or lampblack, may be added.)

Among the newer substitutes for arsenious acid, nervocidin has gained some prominence in the dental profession. Nervocidin hy-

drochlorate, lately discovered by Dr. Dalma of Austria, is an alkaloid prepared from the bark of an exotic plant of East India called gasu-basu. It is neither irritant nor caustic, but a true local anesthetic, temporarily paralyzing the nerve-endings and nerve-centers. Placed upon an exposed pulp it acts within from twenty-four to forty-eight hours; while when placed upon a pulp still covered by a layer of dentin it requires from four to eight days, depending upon the thickness of the dentin. In the latter cases especially it is highly serviceable. It will never cause toxic pericementitis. In extirpating a pulp anesthetized with nervocidin usually a profuse hemorrhage results, indicating that no change in the blood itself has occurred. From the trials made by professional friends and by myself I can recommend this drug to your further investigation. The results obtained are certainly encouraging. For producing insensibility of the soft tissues the remedy has not proven itself to be of value; the slow production of anesthesia, in conjunction with nausea, vomiting, etc., prohibits its use in this direction. Ash & Sons of New York supply the trade.

In 1872-3 Oakley Coles of London called attention to the use of pepsin as a possible pulp-destroyer. Keyes, Linn and others followed, but it was left to Arkoevy to give in 1881 a full explanation of its action upon the pulp. Pepsin has to be applied directly upon the exposed pulp in large quantities. Collapse and fatty degeneration of the blood-vessels and nerve-fibers are the results. Its action is too unsatisfactory, and it is therefore employed in rare cases only.

On August 8, 1900, Dr. Harlan read a paper before the International Dental Congress at Paris entitled "Pulp-Digestion." He found in papain, an alkaloid of carica-papaya, a medium which would, under suitable conditions, convert previously devitalized pulps into a jelly-like mass. This was easily removed with a broach, or by washing with peroxid of hydrogen. Dr. William Van Antwerp of Kentucky in the early '80s first called attention to the digestive property of this drug as a possible means to destroy the dental pulp. Papain (also termed papoid, papayatin, caroid, etc.) is a substance resembling the ferment pepsin, and is therefore termed vegetable pepsin. It is soluble in water and glycerin, and acts in acid, neutral or weak alkaline solutions. Dr. Harlan spoke very favorably of this application for the disintegration of pulp-stumps in small and tortuous canals. He experimented upon freshly extracted

teeth and obtained excellent results. This I can verify, but, sorry to say, experiments in the mouth have been quite unsatisfactory to me. Dr. Thiesing of Berlin has also repeated Dr. Harlan's experiments with papain. He pronounces Harlan's statement correct as far as treatment of teeth out of the mouth is concerned. If the same principles, however, are applied upon the pulps of teeth in the jaws, he can record only negative results. I am still of the opinion—for which I have been so severely criticised—that in all such cases, where it is a physical impossibility to remove the last remnant of a pulp-stump, the operator should apply the mummifying principle which I outlined some years ago. Paraformaldehyd and thymol, in combination with glycerin, in the form of a paste, and applied under aseptic conditions, gives good results, which are verified by clinical facts. From a purely theoretical standpoint the mummifying principle is contrary to the dictum of surgery, but from a practical standpoint the fact cannot be denied that it has saved and is still saving thousands of teeth which otherwise would sooner or later have to be sacrified to the embrace of the forceps.

II. Antiseptics. Eugenol (or, as it is chemically termed, eugenic or caryophyllic acid) is the active constituent of oil of cloves. In general, essential oils are composed of two substances: One is a hydrocarbon known as a terpen, which contains resins, coloring matter, etc.; and the other is an oxygenated body occurring in the oil, and chemically known as an aldehyd, a phenol, an ether, etc. The terpens are valueless as far as the antiseptic value of the oil is concerned; they are directly harmful, as they not alone discolor the tooth-structure—e. g., cassia oil—but they are also highly irritating to the soft tissues if pumped through the apical foramen. It is the oxygenated body upon which the value of an essential oil as an antiseptic or obtundent depends. Volatile oils owe their property as germicidal agents to their diffusibility, which enables them to penetrate readily into protoplasm, thus lessening its vitality by acting as foreign bodies. In addition, they are closely related to the benzol compounds, the members of which are all antiseptics and protoplasm poisons. The more concentrated the essential oil—viz., the more active constituents present—the more rapid and thorough its action as an antiseptic. The value of essential oils as antiseptics is greatly overestimated. For instance, the much-lauded eucalyptus-oil group has very little germicidal power, and as obtundents they are prac-

tically worthless, but the members of this group, which are the oil of eucalyptus, cajeput and myrtle, possess the property of dissolving or rather softening gutta-percha, which is an important fact to remember in the use of this latter material for filling root-canals, setting crowns, etc.

Eugenol, then, a phenol-like body, is a colorless, oily liquid, soluble in alcohol, ether, chloroform, dilute caustic soda solution, etc. As stated above, it is the essential principle of oil of cloves, but it is also found in cinnamon-leaf oil, oil of allspice, oil of bay, etc. It is a non-irritant—nay, on the contrary, it is highly soothing. It possesses great penetrating power, and is an antiseptic of some importance. Clinical experience has shown it to be an ideal remedy for the treatment of the diseased pulp, and in conjunction with cocain hydrochlorate it has marked value as an obtundent for hypersensitive dentin. To obtain the best results in this connection, the cavity, previous to its application, should be washed out with a warm alkaline solution to neutralize any possible acids present, and dehydrated with absolute alcohol. The eugenol-cocain mixture is then applied, and by means of the hot-air blast forced into the dental tubuli.

The silver salts are highly prized as antiseptics; they act by precipitating protoplasm; their action is therefore limited by their own product—viz., silver albumen. This newly formed compound is black and discolors the tissues, thus greatly restricting their very valuable use in dentistry. Of the newer silver salts, Credé's citrate of silver, known as *itrol,* and the lactate of silver, known as *actol,* have gained much prominence, but they also stain the tissues and have found little admiration in dentistry.

For some time past chemists have endeavored to remedy this fault of the inorganic silver salts by preparing a synthetically organic silver compound which would form soluble albumen precipitates. In the last few years quite a number of these compounds have appeared in the market. An early representative is *argentamin.* It is a proteid obtained by the reaction of a 10 per cent solution of silver phosphate upon an aqueous solution of ethylendiamin. The latter compound is a strong alkaline, belonging to the ammonia group. It was thus hoped to increase the action of the silver by adding an alkali which possesses a high solvent power upon the membranes of the microorganisms. Theoretically this is correct, but the alkaline

diamin proved to be too irritating. *Argonin,* a compound of silver, casein and an alkali; *largin,* an albuminate of silver, and *protargol,* a proteid silver compound, are among the recent additions to the list. Of all these preparations *protargol* seems to be the most favored. It is a light yellow powder, containing about 8 per cent of silver very firmly bound to a proteid body, and, unlike argonin, very freely soluble in water. Owing to its firm combination with the metal it produces no irritating effect upon the tissues. It can be recommended as a disinfectant for pus-cavities. For medicinal treatment of the antrum, weak solutions of from ½ to 1 per cent are employed, while for alveolar abscesses from 10 to 20 per cent solutions should be used. In this connection it might be well to mention that Dr. Credé has recommended a form of soluble or colloidal silver known as collargol. Administered in pill form by intravenous injection, or externally as an unguent, it is claimed to be of marked value as an internal antiseptic in septicemia and pyemia.

Most likely the application of metals in their colloidal state will gain some prominence in the near future. Besides silver, mercury, copper and iron are produced at present in the same form, and no doubt gold and others will soon follow. It seems paradoxical to speak of a water-soluble gold, silver, mercury, etc.; still we must keep in mind that this peculiarity is not brought about by a chemical change of the metal itself, but merely by an alteration of its physical condition. This is a highly interesting subject and worthy of further investigation.

Potassium oxchinelin sulphate, better known as *chinosol,* a water-soluble antiseptic of a lemon-yellow color, has lately received some renewed attention in dental therapeutics for the treatment of the diseases of the antrum (Cook). It is employed in 10 per cent solutions. The inventors of chinosol are at present manufacturing a preparation of chinosol and silver called *argentol.* It is claimed to be a non-poisonous and very powerful antiseptic. In using chinosol preparations, keep in mind, however, that they will blacken metal instruments.

No doubt the question of oral antisepsis is a very important one; but for the daily use as a mouth-wash I believe we could largely dispense with the majority of the so-called antiseptics and innumerable new compounds that are thrown upon the market, reinforced by ludicrous advertisements and professional testimonials. A normal,

healthy mouth does not need medicinal treatment; and according to Röse's experiments, most of those compounds, if they are really of value as disinfectants, are irritating to the mucous membrane. A weak solution of bicarbonate of soda or a sterilized physiologic salt-solution—*viz.*, one dram of common salt dissolved in a pint of boiled and filtered water, warmed to blood temperature, is one of the best indifferent buccal sterilizers we have. This has been sufficiently demonstrated, and it deserves the indorsement of the profession. The addition of a small quantity of flavoring agents, such as essence of peppermint, will make the solution more palatable.

III. The Hemostatics. Stypticin.—The question of controlling dental hemorrhage is still a matter of vital importance. This fact usually is not recognized until one is confronted with one of those unfortunate cases where the bleeding simply will not stop in spite of all efforts. Internal medication, as we know, is of comparatively little value. Mechanical plugging of the alveolus, assisted by local medication, has so far proven to be the only reliable mode of treatment. Styptics act either by coagulating albumen, thus plugging up the vessels mechanically, or by chemical action upon the blood. Some remedies seem to act directly upon the vessel wall, causing a constriction of the arterioles; this, however, is questionable. Certain alkaloids of opium and of golden seal are chemically closely related, and to these is ascribed a specific power of acting upon the vaso-constrictor nerves when applied locally; they do not coagulate the blood, but they stimulate these nerves, thus powerfully contracting the vessel-wall. They are termed physiologic hemostatics. If narcotin, an alkaloid of opium, is oxidized under certain conditions, apianic acid and cotarnin are obtained. The latter base is changed to a salt, and it is this newly formed cotarnin hydrochlorate which by Merck is termed *stypticin.* It is a yellow powder of bitter taste, freely soluble in water and warm alcohol. The powder or one of the ¾-grain dental tablets (the form in which stypticin is found in the market) should be placed in the bottom of each alveolus, and each single alveolus should be tightly plugged—preferably with some antiseptic moist gauze. A splint, or, if necessary, digital pressure, will assist in retaining the plug.

Extract of Suprarenal Capsule.—Until very recently none of the animal secretions except the digestive ferments has been utilized as therapeutic agents. Lately it has been shown that certain glands of

the body supply the blood with substances which are of importance in the economy of the functions of the body. Organo-therapeutics, as it is called, is the treatment of diseases with extracts obtained from glands of the animals. For the dentist, the extract of the suprarenal capsule is a valuable remedy. The suprarenal capsules, two small almond-shaped bodies, are situated on top of the kidneys, and belong to the class of ductless glands. They contain a powerful principle, which, when injected into the blood-vessels, causes a very rapid and pronounced rise of blood-pressure. It also produces a marked contraction of the peripheral arterioles—which most likely results from a direct action upon the muscular coat of the vessel. Firth, Abel, Crawford and others have isolated the active principle, and Aldrich and Takamine have recently succeeded in preparing a stable product, which is termed *adrenalin.* If the extract of the suprarenal capsule is used as a hemostatic, only fresh watery mixtures should be employed; solutions will very readily decompose, emitting a highly offensive odor. The adrenalin chlorid solution of Parke, Davis & Co. is an admirable form in which this remedy can be applied for checking minor hemorrhage, as in fitting crowns, bands, etc. Adrenalin has been suggested as an adjunct to cocain solutions for hypodermic injections, theorizing that by its effect upon the blood-pressure it may antagonize the toxic effect of cocain upon the heart. It is further claimed that adrenalin is an antidote for chloroform. Whether the last two statements are correct I am unable to say for the present.

Much has been written lately about the use of gelatin solutions by intravenous injection for controlling hemorrhage. Gelatin contains an average of about 6-10 per cent of a ready resorbable form of lime. Between blood-coagulation and lime exists a close relationship, and most likely the lime present in the gelatin is *the* factor. But it must be remembered that at least the fourth or fifth part of the entire amount of the blood of the individual has to be lost before gelatin will act. It is erroneous to believe that it will lessen hemorrhage by adding it to cocain solutions for hypodermic use, as is advocated by some writers. If used at all, solutions must be sterile. Let me say right here a word of extreme caution in regard to the pumping of drugs into the blood-current. The results are only too often hazardous. Infectious diseases, such as tetanus, are liable to be inoculated. Unfortunately the editors of dental journals frequently do not exer-

cise the necessary care in clipping copy from other journals; spurious formulæ are reprinted which are bound to cause mischief when employed by the unwary.

In the foregoing sketch I have selected only a few drugs. There are a number of other remedies of value which I have not the time to mention, and there are still a much larger number which I will not mention. The majority of this latter class, fortunately, have only a sporadic existence. While we cannot expect any of the enumerated drugs to be a panacea, yet they may possess some specific action which often entitles them to a place for the treatment of a certain ailment, and which may be superior to the drug for which it is substituted. Dr. McClintock, in a paper read before the Biological Society of the Chicago University, has summarized similar thoughts in this beautiful sentence: "Men have for ages sought to find specific remedies for disease. There are but few substances—mineral, vegetable, animal or the products of the chemist—that have not been tried." These attempts have been well expressed by Rossbach as follows: "For thousands of years mankind has experimented in this direction, and the result has been the discovery of but four remedies for three diseases. It would be a terrible idea that some other thousand years were necessary to detect another four remedies. The usual way of proceeding is too slow. Especially harmful proves the enthusiasm, not to say dishonesty, of many observers. If by chance a physician has found a remedy, after the application of which one or two cases of an infectious disease have quickly recovered, the success is at once attributed to the medicine. No thorough investigation on a larger scale is made; the specific has been discovered and is emphatically recommended." How very true this same principle holds good for dental therapeutics one is readily convinced by looking over the current literature.

Discussion.—Dr. J. F. Wallace, Canton: The formula for devitalizing paste is good. I would suggest only the addition of tannic acid, which combines with the albumen of the nerve-tissue and seems to restrict the inflammatory condition that so often passes beyond the apical foramen, producing pericemental inflammation. It also seems to toughen and contract the pulp-tissue, so that when entangled upon the broach it is removed whole, instead of tearing and being removed in threads. The dressing may be left longer, which results in a more thorough devitalization of the pulp.

My experience with papain, though limited to a few cases, has not been altogether satisfactory. While I have used it in only a few cases where the canals were inaccessible to the broach, all were not followed with satisfactory results. It is well to bear in mind that Harlan does not recommend this as a digestive of any but devitalized pulp-tissue; and should there remain even the smallest portion of the pulp undevitalized, that portion will not be acted upon by papain. I consider it of equal value with the process of mummification, but would recommend neither where the broach can be used. In those cases where the broach is inaccessible and resort must be made to some other method, I think the papain worth a trial. It at least possesses the advantage over the mummifying process of not being there permanently, leaving the patient with the idea that the future is provided for; and should it not prove satisfactory, you have placed it there only as a treatment and it will be regarded as such; while, upon the other hand, should the results be unsatisfactory your patient has stronger ground for criticism and censure.

In addition to the remedies mentioned by Dr. Prinz, orthoform might be mentioned as possessing fairly good hemostatic properties. It is a yellowish powder, slightly anesthetic, and quite active as a hemostatic; and when applied to the socket where a tooth has been extracted when in a highly inflamed condition, the pain readily subsides and hemorrhage is controlled to a marked degree.

Dr. G. W. Cook, Chicago: The essential oils have no antiseptic properties apparently, except in a mechanical way, that of irritation. The proposition I make is, that in order to get an antiseptic or disinfectant we must have a remedy that will act upon the lower forms of life, and also act, of course, upon the multicellular structure in which microorganisms are present. As long as you irritate the tissue, so long will you have infection. That is, if you already have infection, and put an agent in that destroys the protoplasm or cell organization, you then render that tissue more susceptible to infection and the encroachment of microorganisms, so the remedy Dr. Prinz has spoken of, chinosol, is the only thing that I have any faith in specially. He referred to the matter of handling this agent with a steel instrument when the remedy will turn black, and when placed in a tube, it will discolor more or less when it comes in contact with iron of any description; but I have found recently that can be overcome very largely by the use of sodium peroxid. After you have

completed your treatment, if you wash the tooth out thoroughly and seal it up with a little peroxid of soda in there, it will take out the discoloration.

Another remedy that I have some faith in as an antiseptic, and which is less irritating than many of the agents that have been used generally by the profession, is tricarsol. It is not very soluble, but it apparently has a stimulating effect on the tissue where we have a long-standing alveolar abscess. It has antiseptic properties, however, but it is not as active a disinfectant or germicide as the chinosol preparation.

Dr. O. H. Kerr, Independence: My preceptor taught me not to use arsenious acid unless I could get free exposure of the pulp. Now my procedure is exactly the opposite, as I do not use arsenious acid if I can get to the pulp at all. I do not know why the essayist uses it, or why he wants to get access to the pulp, unless it is to relieve the pain. Now, I believe that the arsenious acid will kill a pulp if applied to the dentin, or even if applied to the enamel on the outside, if you had some way of keeping it intact. The only thing I use it for in a tooth is where the dentin is very sensitive, and after an application of the arsenic for a few days until the proper obtunding effect is produced. I can then open into the pulp-chamber and remove the contents. In case of an inflamed pulp, I have not found one in three years where I could not use pressure anesthesia and remove it painlessly.

Dr. Prinz: In regard to the preparation of arsenic acting through the tooth-substance, that is a well-known fact, and we do not apply it because it will always cause toxic pericementitis. You may not notice the effect directly, but sooner or later it will affect the peridental membrane. Arsenic on a tooth that is alive will pass through the dental tubuli, though it will not pass through the enamel. If you drill a very small hole through the enamel, and place therein a quantity of arsenious acid, as far away from the pulp as you wish, seal it up and leave it there for a length of time, it will kill that pulp, but at the same time it will induce toxic pericementitis, because the fibers radiate in all directions. I place it directly upon the pulp if possible, because I expect very quick results, and so soon as they are obtained I remove it, because the action of arsenic is unlimited. If you place arsenic upon your arm, after removing the superficial skin, and leave it there a sufficient time, an exudate from

that application will appear on the opposite surface of the arm. When arsenic is ingested into the body it does not act as a poison in the true sense of the word, or have an effect such as we expect from strychnin, atropin or any of the other alkaloids. Arsenic, commonly called, is chemically arsenious trioxid, and when it is ingested into the body it will irritate a cell by abstracting the oxygen until it is taken up by the trioxid, thus changing it to the pentoxid, an unstable compound, breaking up again into the trioxid, causing irritation of the cellular tissue. This toxic action I wish to prevent when I place it on the exposed pulp. I wish it to act as quickly as possible, and then take it away. The older men in the profession will remember that the former method was to place the arsenic in the tooth, kill the pulp, and then remove the drug, leaving the pulp intact. The result was that in five years' time seventy-five per cent of teeth treated in that way were abscessed, due to the resulting pericemental inflammation from the action of the arsenic.

Unusual Fracture of Superior Maxilla.—Franklin Cox had occasion to treat a case in which the left superior maxilla was found to be fractured—the line of cleavage running along the roof of the mouth in the line of the intermaxillary suture, the two middle incisor teeth being almost out, and the mucous membrane being torn for one and a quarter inches in the line of fracture. Upward it ran obliquely to a point about a quarter of an inch above and external to the left ala of the nose, and then descended in a downward and outward direction to a point between the second upper bicuspid and the left first upper molar. The skin over the fracture was not lacerated so much as one would have thought probable, but there was a deep wound, laying the bone bare, and extending from the middle line of the upper lip about a quarter of an inch below the nose upward and outward to the left for about one and a half inches.

Fixing Points in Socket Handles.—To fix an excavator, plugger or other point in a socket handle, do not wrench it into place with pliers, there to rust beyond the possibility of removal without the application of heat and much force, permanently and often seriously marring the two pieces; but rather merely heat to the wax-melting degree the threaded end of the point, touch it to a bit of the hard wax used in bridgework, and after similarly heating the threaded end of the handle, insert the point in the socket, and with only the thumb and finger twist to place. This fixes the point in the handle, keeps it there, prevents ingress of water in cleansing, and therefore rust. To disengage the point for repair, replacement or substitution, it is only necessary to apply heat at the threaded parts and unscrew the point, which is usually done with the thumb and fingers, although in rare instances a pair of pliers may be necessary.—*Dental Office and Laboratory.*

Digests.

PRACTICAL BRIDGEWORK. By Emory A. Bryant, D.D.S., Washington, D. C. Read before the Second District Dental Society, Oct. 13, 1902. You will understand that I do not expect you to adopt my methods to obtain results that may be called "Practical Bridgework," but I do expect you to accept the "principle." Practical results may be had from almost any method, either permanent or removable, or in a combination of the two, but they cannot be had in every case by any one method yet invented. I mean the method must fit the case and not the case be made to fit the method. In choosing a method for a case we must first look for strength, not only of materials to be used but of the finished product. Utility must be first in mind; artistic effect is a secondary consideration. I would sacrifice artistic effect when necessary to obtain strength and utility for bridgework in the mouth, just as a civil engineer will in the case of a railroad or wagon bridge; at the same time I would make the bridge upon artistic lines just as nearly perfect as it can be without encroaching upon the strength required to fulfill necessary service of mastication. Of what use would be a railroad bridge which was made too light to stand the train traffic for which it was intended, no matter how artistic it might be, or what virtue would there be in a bridge made for a mouth that would not withstand the service of mastication, though it might be so artistically perfect as to defy detection. Not only must the bridge structure itself be of requisite strength, but the abutments and the attachment between abutments and bridge must be equally strong, as no completed structure is stronger than its weakest point. Granting then that my principle of strength is right, we may look over the field of methods and try to find one that can be used in the great majority of cases, and which can be depended upon to have the required strength, and that will come out of the investment and final soldering in such condition. In other words, the method that entirely eliminates any guesswork in the process.

Methods Requiring Soldered Facings Condemned.—This requirement alone sets aside all such methods as require soldering of the porcelain veneers or facing upon either the bridge structure or the abutments, for I do not believe the man lives who can say that he is absolutely sure of such a structure coming out of the final solder-

ing of the assembled parts with no facings checked or cracked and the solder having flowed to every desired spot. There is danger in these cases in every soldering from start to finish, in addition to possible warpage in large and extensive cases. Repairs to such structures are problematical so far as strength is concerned, and in most cases they weaken the structure itself. My own repair method, which is almost universally used throughout the country, has this fault: you get the full strength of the facing, but you have weakened the structure itself just to the extent that you have countersunk for the reception of the nuts which hold the facings in place. Drill-

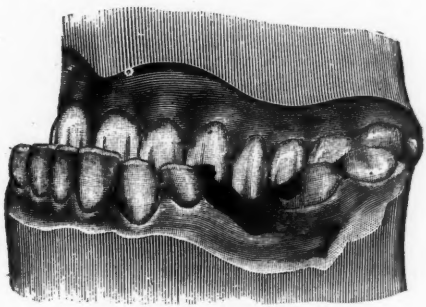


Fig. 1 A.

These models represent the original condition in an extreme case of "short bite," due to age and abrasion of the teeth.

ing holes and riveting with the various tools in use for that purpose is as a rule still less satisfactory.

For these and more reasons the soldered-facing bridge cannot be considered "practical bridgework." I do not mean to say that such bridges should not be used, but I do say that a soldered porcelain-faced bridge is not "practical bridgework" from the standpoint of strength, and repair of such work is generally a makeshift. I will go still further, and say that a soldered porcelain-faced bridge is not "practical bridgework" from either the standpoint of strength or of artistic effect, nor is it a necessity. There are methods where the facings used are not soldered with which everything claimed for the soldered work can be duplicated, and which has none of its failings. Some of these are manufactured and on the market. It is true that the dealers do not keep on hand a large stock of these facings at the

present time, and this fact serves as a hindrance to their general use, but as demand generally brings supply, the profession itself must bear the blame for this condition.

Claims for Originality.—It has not been necessary to go to the dealer for a manufactured article of this kind since 1890, at which time I introduced a system of bridgework, the facings of which are not applied by soldering, and which method requires nothing but a little skill and the facings used in the soldered work. I used this system till some three years ago, when I improved upon it by simply making one cylinder or box instead of two, and by making the

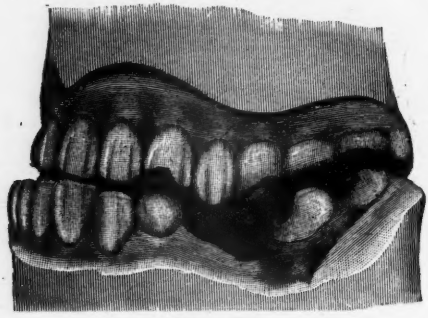


Fig. 1 B.

'These models show the same case opened to show extent to which the jaws were opened by the bridge used.

two pins practically one by applying soft solder between them. These methods allow the dentist to be his own manufacturer and give him the entire field of manufactured teeth to select from, in order to suit each individual case.

Uses for Bridgework.—The mechanical possibilities to which bridgework in one form or another and in combination with plates may be applied, are simply innumerable. There is hardly an operation for the replacement or retention of teeth to which it cannot be of great assistance, if not cover the entire case, except in edentulous mouths. There is not a case of partial loss of teeth to which it is not applicable in some form. In cases of pyorrhea or teeth loosened from any cause it is indispensable, if their retention is possible. It is feasible in many cases of regulating. It has invaded the field of surgery as an assistant in fractures of the maxilla. Our eminent

practitioners who have made a specialty of cleft palates and other diseases of the oral cavity have been compelled to call upon crown and bridgework to help them out of precarious positions. It has even invaded operative work, replacing gold fillings that it has hitherto been impossible to retain in place. It has practically made such a thing as extraction of teeth or roots of teeth a disgrace. All this it has done when in the hands of men of mechanical skill and judgment, and when it has failed to accomplish the work it was intended to do, you may rest assured that it was not the fault of bridgework, but of the man who manipulated it or the patient who wore it. The system itself is invulnerable. There is absolutely no

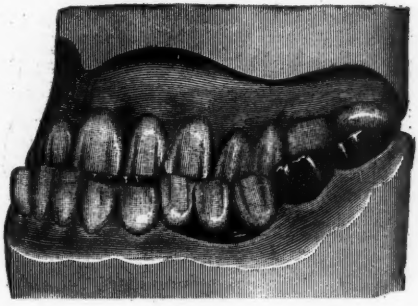


Fig. 1 C.

These models show the same case completed. The posterior bite has been restored with crowns. The anterior abutments are cast gold tips, with dowels entering root canals and attached to each other and to the bridge. The abrasion of upper cuspid was restored with porcelain inlay.

argument based on scientific grounds that can successfully be brought against it. There may be mistakes in its use or from the methods used in construction that open loopholes for fault-finding, but these are faults remediable by men or methods. In combination with platework, it has enabled us to handle cases in a very satisfactory manner, where without its aid it would have been impossible to accomplish anything at all.

I might say that my methods are "par excellence" for all cases where "practical bridgework" is to be obtained, but I am not going to do so for the simple reason that they are not. The only exception, however, is when you have a case where the lower incisors project up into what may be termed a long close bite, and where, in such a

case, my methods of attaching the upper six front teeth would require such thickness of the backing as to project these teeth too far to the front, making too much fullness, but as such cases are in the great minority, it is seldom I am called upon to use some of the other methods.

Close Bite Cases.—I hear a great deal about "close bites" of molars and bicuspids, on account of which this and that method cannot be used. I wish to impress it upon you at this point, that close bites for bridges posterior to the cuspids should not be allowed. There are more failures and cesspools for filth made from this cause than any other, and when you take such a case in hand, the first

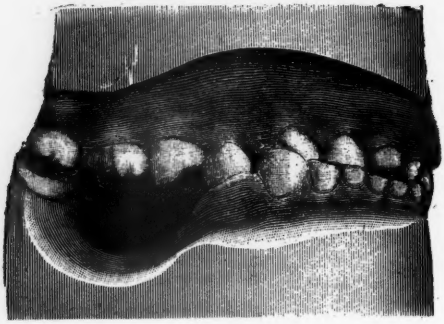


Fig. 2 A.

These models show a case of extreme closure of the jaw due to age and abrasion.

thing is to open the bite till you have room, or do not bridge. This is accomplished by different methods of procedure, and depends upon conditions. You will generally find such cases are caused by abrasion of the grinding surfaces of such teeth as antagonize and elongation of such as do not. The bite should be opened to as near the normal as possible, generally shown by the degree abraded, and when necessary, the elongated teeth should be ground down to a normal length, even if the pulps must be destroyed in order to do so. I am not an advocate of destroying pulps except in case of necessity, and it will require more evidence than has yet been shown by its devotees to make me accept that principle.

The proper occlusion being settled upon, I cannot conceive of a case that will not allow the use of my method of attaching the fac-

ings for the bridge dummies of the bicuspids and molars. As this method is illustrated and described in the July, 1902, number of *Items* by Dr. Hart J. Goslee, I will not take up your time in further description. By this method you can show as little gold upon the grinding surface of the bridge as can be done by any other method, soldered or otherwise.

Combinaton Bridge and Partial Plates.—In case of fracture or breakage of any of these facings a repair as perfect as the original can be made with ease and certainty. In combinations of bridge-

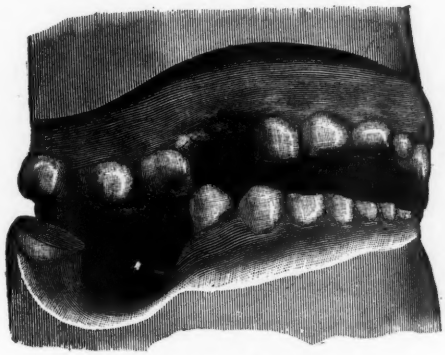


Fig. 2 B.

These models show the same case, and the extent to which it was found necessary to open the bite before bridging.

work with partial plates we have a field as large as that opened by bridgework itself, and where results equally as satisfactory can be had, providing you use my method of clasping. We all know what trouble we have to contend with in partial plates with which we replace lost teeth posterior to the cuspids, both above and below. As I am not an advocate of so-called "saddle bridges," which are sometimes used to replace these missing teeth, and the usual clasp is of but little assistance in handling these cases, I wish to call your attention to what can be accomplished by the use of my clasp. Taking a lower partial case, all teeth missing posterior to the cuspids, the plate and the attachments of the teeth are the same in construction as for any clasp plate, but as I need to have guides for my clasp to grasp, I must also have the two abutment teeth crowned, in this case

they being the lower cuspids. If you are contented to use an open faced crown upon these teeth, the guides can be soldered to this, or if wedded to the show-no-gold idea, you can cut them off, and using my crown with replaceable facing, get the ends of the clasps to run in a groove instead of upon guides soldered upon the sides. By this method you can insert a denture that it is absolutely impossible to tip or raise up, and which nevertheless can be removed with ease by the patient, and which will not loosen the abutment teeth to which the denture is clasped. In the upper the procedure is the same,

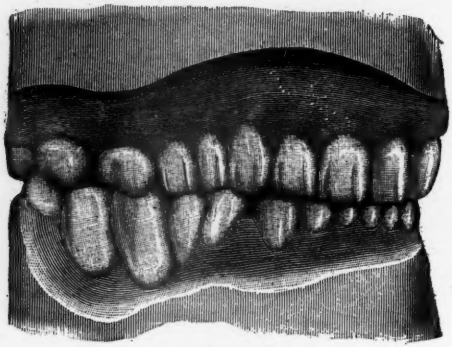


Fig. 2 C.

These models show the same case completed. In the upper saw the anterior teeth are restored with porcelain band crowns. Bridges fill the gaps, posteriorly above and below. The lower incisors were also crowned.

using either a horseshoe plate or one covering the entire roof of the mouth, according to conditions. For removable bridges I doubt very much if there has been anything invented to date which will give the same stability to the denture without damage to the abutments as this method of clasping.

Last but not least, the greatest advantage is the fact that the dentist manufactures every detail of the structure from start to finish, from materials found in any dental depot, and in making repairs, should they be required, the materials are always at hand. The directions of the dentist to the patient at the time of inserting the work are such as to enable the latter to instruct any dentist who might be called upon to make a repair of a facing, no matter if the

dentist never saw a piece of bridgework in his life. This applies to the bridges, crowns and abutments, but the clasping feature requires some knowledge of the method in order to make a repair, but the same thing applies to any of the manufactured attachments.—*Items, Jan., 1902.*

INFLUENCE OF NASAL AND NASO-PHARYNGEAL OBSTRUCTION UPON THE DEVELOPMENT OF THE TEETH AND PALATE. By A. L. Whitehead, M.B., B.S.Lond. The nose, as you are aware, is a cavity enclosed by bony walls, and divided by a bony and cartilaginous partition into symmetrical halves, each opening posteriorly into the naso-pharyngeal space. The cavity is lined by a vascular membrane, which is continued over the outgrowths from the outer walls known as the turbinate bones. The function of the nose, so far as respiration is concerned, is to warm, moisten and filter the air before permitting its passage to the lungs. The function of respiration is carried on some 20,000 times in the twenty-four hours, and as Mayo Collier puts it, "if by day or by night nasal respiration must be supplemented by oral respiration, then there is nasal or naso-pharyngeal obstruction." Nasal obstruction is due to abnormal conditions of the turbinate bones by bony or soft tissue hypertrophy, to deviations or exostoses of the septum, to congenital stenosis of the nares, foreign bodies, rhinoliths, new growths, to contraction by growth or inflammatory swelling outside the nose. Naso-pharyngeal obstruction is due to the presence of adenoid vegetations, new growths, enlarged tonsils, or prominence of the atlas. In the naso-pharynx of all children a certain amount of adenoid tissue, known as Luschka's tonsil, is normally present, and in certain cases the tissue is prone to active inflammation and hypertrophy. The cause of this hypertrophy is not clearly known. It is essentially an affection of childhood, and has been found in the earliest months of life. I remember assisting in the removal of a mass of adenoid tissue from a child ten days old where the obstruction to nasal breathing was complete. Wurdemann of Milwaukee, in an analysis of 247 cases, with sufficient hypertrophy to necessitate operation, finds this affection most common from 4 to 12 years of age, especially at 7 and 10, and rare after 17. My own experience coincides with this, but I have also found that cases occur in young

adults from 16 to 20, without symptoms of nasal obstruction, but causing deafness.

Corwin remarks that owing to the small size of the respiratory passages in children functional interference occurs from the hypertrophy. The increase in the dimensions of the post-nasal and pharyngeal spaces which takes place rapidly during adolescence may overcome a marked obstruction should this remain stationary or increase only slightly in size. This may in part account for the opinion that adenoids invariably disappear or rapidly decrease in size at puberty. Boys are more frequently affected than girls, and frequently several members of the same family are affected. Other causes favoring adenoid hypertrophy are conditions of the general circulation favoring turgescence, such as intestinal irregularity, the strumous diathesis, damp and cold climate (Massei states that adenoids are very rare in Italy), diphtheria, whooping cough, influenza, the acute infectious fevers, anterior nasal obstructions, and cleft palate, where probably the irritation from food and cold air is the direct exciting cause.

Nasal and naso-pharyngeal obstruction occurring during the period of growth has many and far-reaching consequences upon the development of the child. The typical picture of such a case is no doubt familiar to all of you: the vacant face, open mouth, hanging jaw, the curiously-toned voice, nasal discharge, the history of snoring at night, diminished hearing, and recurring headaches, and, in older children, the high palate, irregular teeth and deformed chest. It is to this special action on the development of the dental arches to which I wish to draw attention.

So long ago as 1876 Michel had observed and pointed out the association of habitual mouth-breathing with the presence of a high-arched, narrow, hard palate. Some of the earlier writers were inclined to regard it as a hereditary manifestation, or as associated with rickets. But the lesions due to rickets occur in early infancy, and manifest themselves more in the lower than in the upper maxilla, and although the congenital influence on certain types of nose or on the formation of the face cannot be denied, still it plays a minor part in producing the changes under consideration.

Mayo Collier has seen children whose parents were possessed of remarkably well-formed upper jaws and regular features, and who in early life had symmetrical dental arches, and has seen the same

children in later years after a period of obstruction to nasal breathing. The jaws had then become altered to the type to be described shortly, showing clearly that the deformity was brought about not by any hereditary influence, but by the obstruction to nasal respiration produced by the presence of adenoid vegetations. Naso-pharyngeal obstruction is so frequently found in the post-nasal passages of children of one family that such influence as heredity exerts is probably manifested in this direction.

Körner has pointed out that two varieties of deformity of the maxilla are found dependent upon the presence of adenoid vegetations before or after the second dentition. When nasal respiration is obstructed in a growing child before the second dentition the palate assumes a higher elevation in course of time, and appears in section dome-shaped instead of slightly curved. The alveolar process forms an ellipse instead of a semicircle, and the lateral portions are approximated, the whole growth of the maxilla is retarded, but the deciduous teeth are in their normal position. But after the second dentition, if the adenoids have not previously been removed, the maxilla undergoes much more pronounced changes. The alveolar processes become still more approximated, the palate more elevated, even resembling a Gothic arch, the anterior part of the alveolar process becomes inclined forward, the lateral halves form an angle at their median junction, and the jaw assumes the V-shape so well known to you. These changes necessitate alterations in the position of the teeth. The median incisors are turned so that their lingual surfaces look towards each other. If the growth has been much retarded by prolonged obstruction the teeth are crowded out of their normal places. The lateral incisors, and frequently the bicuspids as well, are pushed inwards, while the molars turn outwards. Since the lower maxilla develops at the normal rate, it frequently happens that the outer edges of the upper bicuspids strike against the inner ones of the bicuspids of the inferior maxilla. In consequence of the elongation of the antero-posterior axis and of the oblique position of the incisors it frequently happens that the incisors do not approximate.

The direct method in which the obstruction to nasal respiration brings about these changes is a matter for speculation, but that they are brought about by this agency is quite certain. Ziem has produced similar changes in young animals by blocking the nose for a long period with cotton wool, the alterations produced when only one

nostril was blocked being of the most obvious character. There was a general arrest of development, not only of the upper jaw, but of the palate bone, frontal bone, ear and the whole side of face.

Three explanations have been suggested. The first is based on the interference which obstructed nasal respiration necessarily has upon the development of the nose. As Freeman has pointed out, the hard palate in the infant is normally highly arched, so that in the ninth month of fetal life the hard palate lies above the level of the Eustachian tubes; at birth it is on the same plane, and later on considerably lower. This is due to the downward growth of the hard palate, so that one factor in the production of a highly arched palate is a lack of development of the walls of the nose, more especially of the sphenoid and the septum, while the alveoli and the rest of the face develop at the ordinary rate. This descent of the hard palate is made still more evident when we recollect that in the infant the posterior nares are almost round, while in the adult they measure twice as much in the vertical meridian as in the horizontal. Therefore, if any factor interferes with the development of the child and of the nasal cavities, it will retard the proper development of the hard palate and its consequent descent.

The second theory is one about which the most divergent opinions are held, that is, the lateral pressure which the cheeks, aided by the weight of the lower jaw, exert against the maxilla when the mouth is kept open. By some authors this is regarded as the chief agent in the production of the changes in the upper jaw, and their explanation is as follows. The position of the tongue is altered in the habitual mouth-breather. Normally, when the mouth is closed the tongue lies against the teeth, the palate and the alveolar processes, but when the mouth is open the tongue lies in the lower maxilla and there is no pressure against the upper maxilla. Before dentition the unopposed lateral pressure of the cheeks produces a narrowing and lengthening of the alveolar process, and during both periods of dentition, especially during the second, the processes are still more closely approximated, the maxilla becomes more elongated, the descent of the palate is still further retarded, and the resultant changes in the position of the teeth follow, whereas the lower maxilla develops in the ordinary way and remains practically normal. The loss of the deciduous teeth and the greater vascularity of the maxilla during the period of growth of the permanent teeth are regarded by Körner

as the causes of softening of the maxilla, which explains the marked character of these changes during the second dentition.

Mayo Collier's theory, that the air stream passing through the mouth and past the naso-pharyngeal space produces a negative pressure in the nose and therefore a positive upward pressure on the lower surface of the hard palate, while ingenious cannot be regarded as a complete explanation.

It seems very probable that each of these theories is to some extent correct, but that no single one is sufficient to fully explain the mode of production of these deformities. It is, however, quite certain that interference with nasal respiration is capable of producing serious and extensive deformity of the teeth and jaws, and that by the restoration of nasal breathing this disfigurement of the maxilla can be prevented, and if seen at an early stage considerably alleviated, the constant stream of air expanding and developing the upper jaw.

There are many cases of V-shaped deformity of the maxilla with anterior protrusion due to other causes, but interference with nasal respiration is so common a cause that the condition of the nose and naso-pharynx should be investigated in all these cases. The condition is eminently a preventable one.—*Jour. Brit. Dent. Assn.*

FRACTURES OF TEETH AND THEIR TREATMENT. By Otto E. Inglis, D.D.S., Philadelphia. Read before the Southern Dental Society of New Jersey, Oct. 15, 1902. Teeth are often fractured by the application to them of stress in excess of their resisting capacity. Their natural ability to resist may be great, and dependent upon the cohesive force of thick, well-formed tooth substance, or it may be slight, as in the case of a thin incisal edge. A lessened resistance to stress may be acquired through the action of dental caries, which by removing dentinal support lessens the strength of the tooth. The peculiar phases of fracture are interesting and sometimes puzzling. During the course of abrasion the enamel is worn to a sharp edge which, presenting fairly to the opposing teeth, renders it more readily fractured than when a rounded surface comes into occlusion. As a result oblique splintering occurs in the line represented by the interprismatic cement substance between the enamel-rods. The enamel edges become ragged and further fracture

is imminent. In some cases a filling may be necessitated because of an unusual depth to one of the concavities produced, but as a rule it is better to trim the uneven edges with a fine grit wheel. Slightly rounding the outer edges restores them to the shape least liable to fracture, and if the concavities are ground out and polished the appearance is usually less objectionable than where fillings are introduced. The latter require undercuts which weaken the remaining enamel, which requires all of the cohesive force. Of course, the limitation of future abrasion by appropriate means is indicated. If the fracture at the incisal edge be slight the edge may be trimmed up to a proper shape and the tooth drawn down to make a correct incisal alignment.

Blows upon the teeth may produce either the actual splitting off of one of the angular portions of the crown, or such a fracture as sometimes occurs in a pane of glass from a light blow from a stone. In the latter case the cracks are formed in every direction from a central spot. Such a fracture occurs on immune surfaces as a rule and does not necessarily seriously involve the elastic dentin, so that no particular treatment may be necessary. If the corner of a tooth be removed by the accident, the corner may simply be rounded if it be a distal angle, or restored by fillings, etc., if a mesial one.

More serious is that form of fracture in which the line of partition runs obliquely and involves a consideration of the pulp. In some cases the placement of a hollow gold crown for a time may be resorted to with a view to the completion of root formation in the case of a child, or to the eventual recession of the pulp and formation of secondary dentin. In the former case a pure gold crown would seem advisable, as the gold may be burnished nicely to fit the tooth at the neck. The contour of the tooth thus need not be destroyed by grinding. Later, after root formation, a crown of different construction may be used or a filling inserted.

When the fracture occurs in a fully developed tooth the pulp-canal may be utilized for anchorage of a filling. If the pulp be exposed by the fracture pressure anesthesia is suited to its immediate removal, though cataphoresis, cocain injection, and arsenic may upon occasion be used.

If the fractured portion extends slightly beneath the gingival border and hangs in position, it is better to remove it, shape the cervical dentin and cementum, and restore the contour either with

amalgam or with gold, if possible; suitable retention of course, being made.

If a crown band be used in such a case, the foregoing restoration may first be made with amalgam, or the band be permitted to extend upon the fractured side so as to grasp the cementum above the line of fracture. The latter method is somewhat likely to cause irritation and is not, as a rule, to be preferred. If the slight extension of the line of fracture occurs on the buccal side of a bicuspid root, the porcelain facing, if one be used, may be permitted to lie in the place of the loosened portion against the somewhat modified root face. A broad band attached to this facing may encircle the remaining sound lingual portion. This is often better than using a pin attached to the facing and extending into the pulp-canal. It also has application when the pulp is vital and covered by dentin. If the fracture is of such a character that the apex of the splintered portion runs deeply beneath the gum line, and the splinter can be set in a correct position after the manner in which portions of a fractured plaster model may be approximated, it seems to be good practice to encircle both the sound and fractured portions with a strong band, as, for example, a hollow metal crown. Theoretically trouble should arise from septic fluid in the joint, but I have several times employed with satisfaction the method of inserting thin cement, either zinc phosphate or oxychlorid, into the joint. The method is to open the joint before setting the crown, sterilize with campho-phenique, carbolic acid, etc., dry, insert the soft cement and approximate the parts then set the crown.

If treatment be necessary the points of contact of the parts should not be destroyed. The parts should be ligatured with varnished silk floss and the treatment conducted. In case of a live pulp, pressure anesthesia, etc., would be preferable to the use of arsenic. It has happened several times in my experience to be called upon to care for otherwise sound molars and bicuspids fractured from the occlusal surface to the bifurcation. In some cases a simple band has been cemented about the crown at about the contact surfaces; in other cases a full hollow metal crown has been placed after appropriate grinding. The treatment in such cases has been conducted with ligatures about the parts through occlusal openings and before placing the crown. It is surprising how long such fractures may exist untreated without marked discomfort to the patient, though eventu-

ally food forces into the crevice, which gradually widens, and the discomfort appears. I have carefully looked for fractures due to pulp congestion, but as yet have not found such a case.

In certain cases bands near the occlusal surface are objected to as unsightly, and in such I have occasionally utilized a strong band of twenty-eight gauge twenty-two karat gold deeply set beneath the gum margin and about the reduced crown portions. This is faced buccally, capped, and a thin cuspid facing mounted. This is backed with pure gold from the bevelled cervical tip to the bevelled occlusal tip and is waxed to the cap, the form is contoured in wax and this is duplicated with the solder. The whole is cemented to place.

Under certain circumstances pins or staples may be anchored in two separated roots for obvious purposes. Such fractures as remove entire crowns, leaving serviceable roots, present no features not familiar to all crown workers. Such fractures as occur in cavity walls as the result of dentinal support also require merely the mention.—*Brief, Dec., 1902.*

EXPERIMENTS IN PLASTER TO TEST COMPRESSION OF MODEL IN CLOSING FLASK. By Stewart J. Spence, D.D.S., Harriman, Tenn. The writer was first seriously impressed by the fact that plaster of paris is a compressible substance when, about seventeen years ago, while conducting experiments in celluloid, he found that a small piece of celluloid placed between the two halves of a flask filled with plaster would, on the flask being closed at 320 degrees F., embed itself deeply in the plaster. (See Prof. Richardson's Mechanical Dentistry, article "Celluloid Base.")

That misfits may arise from a model of plaster of paris being compressed out of proper shape in closing flasks on rubber, especially when the plaster is newly set, and still more so when excess of rubber is present, is abundantly proven by the following:

Experiment 1.—The lower half of a flask was filled with plaster, and shaken till level and smooth. On this the upper half was poured. Four hours later this flask was opened and a wad of vulcanizable red rubber of about fifteen grains in weight was placed between these halves and they were closed on it in hot water. No escape gates had been cut. To bring the two parts together required strong pressure. No rubber was seen to ooze out at the edges of

the flask, and it was therefore evident that it had embedded itself in the plaster. Upon opening the flask the rubber was removed, and then the plaster of the lower section of flask was taken out entire (the flask having been previously oiled for this purpose) and was sawed asunder across, from guide-pin to guide-pin, thus exposing the center. This revealed a space made by the rubber between the two masses of plaster wide enough at its center to admit twenty thicknesses of the paper of the little books in which gold leaf comes to us. As forty thicknesses of this paper measure about one milli-

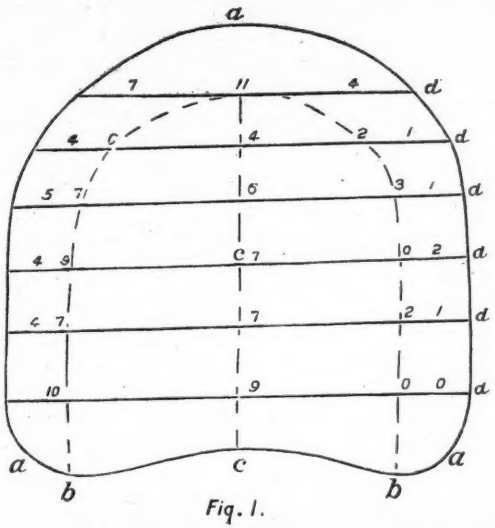


Fig. 1.

meter, this gave 0.5 millimeter as the extent of compression. However, this was with "green" (i. e., newly mixed) plaster, and without waste-gates, and therefore the compression must have been greater than is common in actual practice. A second test was therefore made with plaster otherwise similar but given about twenty-four hours to harden, when only fourteen thicknesses of the paper could be inserted.

Experiment 2.—To test the compression of a plaster ridge in closing flasks on rubber, a section of ridge was made thus: A small sheet of tin, one by three-fourths of an inch in dimensions and one millimeter thick, was bent over a pencil into trough-shape and then

embedded in plaster in the lower half of a flask near the heels. The upper plaster was then poured, and twenty-four hours were allowed for hardening. On being opened the tin was removed, exhibiting the plaster ridge, a good representation of a lower jaw. Some metal was filed from the heel of the flask, and some plaster cut away, in order to give (when flask should be shut) access to the space made by removing the tin. The measurement of said space was then taken through this opening and found to be forty thicknesses of the foil paper. With careful avoidance of excess, rubber was then packed in this space, and the flask closed with hot water. On opening, the rubber was removed and the tin placed back on the ridge, when it was found that two thicknesses of the foil paper would go between the summit of ridge and the tin. This showed that a slight compression had taken place, even with an abundant waste gate at one end and with every precaution to prevent excess of rubber. In the next test a considerable excess of rubber was used and the flask closed again. In opening, the entire space (the tin not being replaced this time) admitted forty-four thicknesses of the paper—its original capacity, as we said, being forty. This demonstrated the ill effects of excess of rubber. But this had been made with an abundant escape gate, one end being wide open. In the next test this gate was closed up with plaster, and an excess of rubber was packed into the space, and the flask closed again. This time the space admitted forty-eight thicknesses of paper, showing the evil results of not providing escape gates. These tests gave 0.05 millimeter as the compression under the most favorable circumstances, and 0.2 millimeter under the least favorable.

If compression were equal all over the model it would probably be of benefit in cases where the model is made of an expansive plaster, because it would counteract this expansion by reducing through compression the size of the model. But it must be remembered that the pressure is not equally distributed over the model, but must fall more directly upon the confining palatal hollow than upon the buccal slopes, and also its influence must be greatest at points most remote from escape gates, which in the upper model would be about the center of the palate, and in the lower the summit of ridge. Now, as a compression of the model means a corresponding protuberance of the vulcanite plate, this theory makes compression greatest at those points where we would prefer it to be least.

Again, in cases where in waxing up the teeth come in actual contact with the model, the compression must be greater than where there is a cushion of wax, and eventually rubber, between model and tooth; and so the resulting plate must be unevenly protuberant at these points. That this does occur is evident from the fact that although the dentist in waxing up often sets teeth directly on the model, yet they never appear bare in the plate, a film of vulcanite always covering them. Either these teeth are forced into the "green" plaster of the investment, or the model is compressed by them, or both these evils occur.

To test the above theory of pressure falling most on the center of the palate, the following experiment was made. It showed, however, that excess of rubber in packing the case played a more important part in this matter than does remoteness from escape gates, etc.

Experiment 3.—A sheet of tin about one millimeter thick was roughly shaped over an old model of an upper jaw to represent a wax base plate, minus teeth. This tin plate was embedded in plaster, palatal surface up, in the lower half of a flask, and then the upper half of the flask was filled over it. This investment was given till next morning to harden. It was then opened, and the tin plate was removed. The space made by this removal was then filled with rubber, with slight excess, and seven gates cut. Closure was made with boiling water. The case was then opened and the rubber removed. The tin was replaced in the lower half of flask, and the plaster in the upper was removed entirely from the flask, and then it was gradually cut away by cross sections, commencing at the heels, cutting from heel to heel. At every quarter inch the cutting paused to take measurement of the compression. This measurement was made by inserting strips of foil paper between the tin plate and the model. Fig. 1 shows the result. In it *a a a* represent the buccal and labial borders, *b b b* the ridge, and the *c* line corresponds to the palatal suture, while *d d d d d d* indicate the six cross sections. The figures placed along these lines, or between them, give the number of strips of foil paper admitted between tin and plaster, at the points marked by the numbers, thus indicating the extent of compression. The reader will see at a glance that the greatest compression, 11, is located at the locality of the central incisors. Also that the space at the buccal surfaces is least, that on the right side being almost nil. (The discrepancy between the two sides was caused by failure to

fully close the flask on the right side.) Observe also the irregularity of these spaecs, as where one of them jumps from 0 to 3. No doubt this was due to the rubber being thicker at 3 than 0. The vast discrepancy between 0 and 11 has something startling about it.

The moral to be drawn from these experiments is, that compression of plaster of paris models in flask-closing is a very serious matter—more serious than has been generally believed, and one that calls for remedy.

Remedies Against Compression.—Various remedies suggested themselves to the writer's mind—(1) to use a more easy flowing rubber; (2) to increase escape gates; (3) to find some exact method of measuring the quantity of rubber required by each case; (4) to close with dry heat, and thus get a higher temperature than boiling water for softening the rubber; (5) to use some solvent for rubber; (6) to increase the hardness of the model.

To amplify on these various remedies: (1) I found by experiment that there is a considerable difference in the packing qualities of various rubbers, some flowing more easily than others. As a rule those most adulterated have the easiest flow. (2) To increase escape gates, I not only made the usual ones more deep and numerous, but also drilled holes down through the investment from the palatal region to the top of the plaster and out at holes drilled in the upper lid of the flask. (3) After carefully measuring the rubber by the displacement-of-water method I would leave out a good-sized piece of the measured rubber, closing the flask without it, then reopen, and at the place where an insufficiency appeared (if at all) add small pieces and close again. (4) I tried closing with dry heat in order to get higher temperature than that of boiling water, but I found that the temperature of plaster cannot be raised beyond 212 degrees until the moisture in it has passed off in steam, which requires from one to two hours for an investment in flask, but a cast when thus dried is much harder, and if closed with dry heat is much less compressible. (5) I had learned from Dr. Eben Flagg that coal oil applied to a freshly cut surface of vulcanite aids in cohesion in repair cases, and I had noticed that a piece of vulcanized rubber which fell into some coal oil spilled on my work table was much softened thereby; so I tried coal oil as a solvent for rubber in flask-closing. An experiment much similar to that of No. 1 was made, both halves of a flask being filled with plaster. These were first closed in hot water on a piece

of rubber, and great exertion was required to bring them together, and the rubber did not exude at their edges; then the same piece of rubber was soaked in coal oil and again closed down upon by the same two halves of the flask, this time without heat. The result was that the flask closed exceedingly easily, and the rubber oozed out at all sides at its edges. Of course, there was then no compression of plaster. On seeing this I felt like Archimedes as he ran naked through the streets of Syracuse shouting "I have found it!" But, alas, I soon found that the dissolving of rubber in coal oil retards its vulcanization. Other solvents were then tried—chloroform, sulphuric ether, gasoline and benzine. Of these four, while all retarded vulcanization, benzine proved the best. Chloroform sometimes produced little pits in the vulcanite. Ether was not sufficiently active as a solvent, and when combined with benzine (one part ether to two parts benzine) it produced porosity. My present practice is to employ a mixture of one part benzine and two parts alcohol, dipping the rubber in this mixture before packing it, and closing the flask with the additional aid of hot water. This does not appreciably retard vulcanization, and it makes flask-closure a much easier operation. If, however, there is the slightest opening at a point, the rubber will penetrate it. (6) My chief efforts were directed to hardening the model, and it was here that the greatest success was achieved. A compound which I had been using as a substitute for plaster of paris has already yielded me non-expansive casts, and now, as a result of further research, I have obtained with it a hardness about five-fold that of plaster of paris and equal to low-fusing metal. With this strength of model compression is eliminated.—*Items, Dec., 1902.*

FORMS OF PSEUDO-MEMBRANOUS STOMATITIS AND THEIR TREATMENT.—FETOR OF THE BREATH. By Dr. Edg. Hirtz, in *L'Odontologie.* Stomatitis, or inflammation of the buccal mucous membrane, may supervene as a complication of a great number of more or less grave infectious conditions, or in the course of general good health; and when you have to deal with patients where you may suppose a more or less abundant elimination of toxines or of irritant principles by way of the secretions, always examine their mouths with care, and very often you will find there more or less advanced lesions. Thus one must know that

these local lesions are susceptible to amelioration, and even to cure, under the influence of appropriate treatment.

I shall take for the type of my study uremic stomatitis, which is an uncommon form of these affections, and of which we possess at the present moment a very fine example in the service in the Cruveilher ward. I will devote a portion of this paper to the exposition of this remarkable case, by emphasizing the peculiarities which distinguish uremic stomatitis from similar inflammations of different origin; then we will briefly pass under review the treatment of stomatitis in general, and the fetor of the breath.

The patient in question was attacked a few years ago by scarlet fever, and was a long time in becoming convalescent, and since that time his health has never been perfectly established. He was subject to headaches, eye troubles, and soon exhibited polyuria and nocturnal pollakiuria. These symptoms obliged him to cease working at times; he nevertheless resumed after a few days of repose, during which he had subjected himself to a more or less abundant diaphoresis by means of the ingestion of a certain quantity of tisane. But these troubles, the renal origin of which did not appear doubtful, only became more and more acute, and in January, 1902, he was seized with anuria and entered the hospital.

Upon examination his condition was found to be as follows—His face was pale, edematous; his lips were cyanotic; the extremities cold; the legs showed edema, as well as the prerenal wall. Sibilant rattling was heard in the entire height of the two lungs, and there were signs of congestive hearths at their bases, particularly developed on the right side. Tachycardia was found, and there was a galloping noise; the pulse was flat—almost imperceptible. The patient complained of cephalemia, and became a prey of violent dyspnea; the anuria was almost complete. There were some gastro-intestinal troubles. The tongue was white, the breath very fetid; the teeth were fuliginous. It was easy, from the picture which we have briefly described, to recognize that the patient had fallen a prey to an attack of uremia. These signs predominated in regard to the respiratory apparatus, but there were also digestive troubles; and, for my part, I consider this case as belonging to a mixed form of puremia, participating at the same time in the dyspneic and gastro-intestinal form. Applications were made with scarified cupping-glasses at the level of the bases of the lungs, and 15 grams of

German brandy were prescribed. The condition of the patient sensibly improved in consequence of the treatment.

One symptom which struck us in his case from the outset, and which did not appear to decline at all, was the fetor of the breath, which was extremely strong, repulsive, and nauseous in the highest degree. The mouth of the patient was therefore examined, and the following lesions were found to exist—In the first place, there was noticed upon the teeth a whitish and thickly viscous deposit, which bore witness to the absence of dental care for a long time. Upon the gums were found ulcerations covered with a pultaceous coating; upon the internal surface of the cheeks, at the level of the dental arches, were observed grayish patches with rounded festooned contours. On seeking to detach the pseudo-membrane which covered them, it was seen to be very adherent. These patches were particularly developed and confluent on the right side of the buccal cavity. We observed at the level of the first upper incisor an oval patch measuring 2 centimetres in length. On the right side the maximum of the lesions was situated at the level of the molars. On this side were observed three patches possessing the dimension of a fifty-centime piece. Upon the mucous membrane of the posterior surface of the lips were found similar lesions but less marked, the aspect of which recalled rather that of aphthæ at the erosive period of the eruption. (They are small exulcerations, the edge of which forms a kind of reddish collaret.) The buccal mucous membrane was congested. Let us add that one was able to seize the tissue of the cheek between the fingers without finding any induration as in noma, to which the strong fetor of the buccal cavity might have led our thoughts. The patient, therefore, exhibited *uremic stomatitis;* we shall see, in fact, the phenomena of uremic intoxication explain the irritation and inflammation of the buccal mucous membrane.

Uremic stomatitis has not been known very long. It was Barié who first clearly traced the history of these particular manifestations of uremia. He has described two forms of them. In the *erythemato-pullaceous* form of uremic stomatitis, there occurs first a diffuse redness of the buccal mucous membrane; the tongue, generally, is wide, spread out, and covered with a pasty, thick, glutinous coating, which calls to mind the appearance of sticky paste. Upon the gums, likewise, there exists a uniform layer of this coating. Sometimes the whole buccal cavity is lined and even obstructed

with it to such an extent that one may have difficulty in opening the mouth and examining its interior, as I have observed in the case of another patient who was uremic, but where the diagnosis was established only at the autopsy. The saliva is scant, thick, and viscous.

The second, or *ulcerous form* of uremic stomatitis may be discreet or confluent. It is characterized by ulcerations the extent of which varies from a few millimetres to a centimetre in diameter, and the depth of which is more or less considerable. Their form is ovaline or circular, and more or less regular. They are covered with a pseudo-membrane, under which is found a purple, turgid, sometimes sanguinolent mucous membrane. These ulcerations are rare upon the tongue. They may invade the interior surface of the cheeks, the posterior surface of the lips, with a predominance more or less marked on one side or the other, above or below, or they may extend over the whole of the buccal mucous membrane. The salivation is sometimes diminished, sometimes augmented. In a case which Barié had the patient produced 900 grams of saliva in 24 hours. This saliva in the normal state, as you know, always contains a certain quantity of urea—scarcely exceeding a few milligrams or from 2 to 3 centigrams, exceptionally from 20 to 50 centigrams; in the pathological state, on the contrary, there occurs in uremia 5 or 6, and even in one case as much as 9 grams of urea in 24 hours; the patient therefore produces almost as much urea in his saliva as in his urine.

This uremic stomatitis prevents mastication, and is accompanied by marked anorexia. The breath is extremely fetid, and induces one to think of gangrene of the mouth. On the other hand, the general state which coexists with these local lesions is always grave. The patients are most often in a very marked condition of adynamia. Uremic stomatitis may be observed in all forms of uremia, but it appears most frequently in the gastro-intestinal form. The prognosis of uremic stomatitis is of necessity very severe, on account of the gravity of the disease which it translates, but under the influence of the treatment which I am about to indicate it may become attenuated and even cured. When the ulcerations have been profound there remain more or less durable cicatrices, but in ordinary cases the ulcerations leave no trace whatever of their existence. The difficulty in curing these lesions is due to the fact that we have to

do with individuals who constantly eliminate toxines infecting the buccal passage, and at the same time urea, which is an irritant agent to the mucous membrane and favors its infection. Therefore we must not be astonished if uremic stomatitis assumes a *chronic form.*

In the treatment of uremic stomatitis we must not neglect the general treatment of the cause. It is thus that scarified cupping, powerful purgatives given or injected, in certain cases bleeding, at the same time that they combat the disease—which greatly menaces the existence of the patient—sensibly ameliorate the condition of the mouth. These agents act by diminishing the quantity of the toxic principles, and ultimately cause their elimination, but independently of this indirect general treatment, recourse must also be had to local treatment.

For the purpose of setting it in motion in a rational and certain manner, we lack, it is true, very clear pathogenical knowledge in regard to the genesis of uremic stomatitis. The researches which it has been possible to make on the subject of the infectious agent have remained without precise results. The bacteriological examination of the scrapings of the buccal mucous membrane affected with uremic stomatitis have shown only indeterminate *cocci.* On the whole, it is not fixed what the pathogenic agent of this affection is. Consequently, there is no specific treatment to oppose here, and it is a common treatment to which we have recourse. One might, for example, employ washings, irrigations in the buccal cavity, by employing as an antiseptic liquid either boricized water, or a solution of permanganate of potash, 1 to 1,000 or 1 to 3,000 parts, but I specially recommend to you in these cases the employment of oxygenated water, at 12 volumes deduplicated or detriplicated. The rinsings with oxygenated water give excellent results in uremic stomatitis, and in general in all cases of more or less advanced inflammations of the bucco-pharyngeal mucous membranes, characterized above all by a marked fetor of the breath.

I desire to emphasize this question of buccal fetor and its origin. From the researches which I have instituted, and particularly in analyzing the collected mucosities obtained by the scraping of the divers regions of the buccal, lingual, gingival and other mucous membranes, I have found that the maximum intensity of the fetid odor has its seat in general at the level of the base of the tongue, and that it appears to be due chiefly to the presence of anærobic

germs. It is this which would explain the particularly efficacious action of the oxygenated water in these circumstances, for it has been experimentally verified what an intense action this substance exercises particularly upon anærobic bacteria. It therefore renders immense service in all cases of fetid breath, whatever may be the origin. A number of persons in good health are affected with this sad infirmity, the persistence of which, notwithstanding all the minute care which they take of their mouths, makes them desperate. I have succeeded by the aid of rinsings with oxygenated water in making this repugnant odor completely disappear in people who were afflicted with it.

I also recommend, in order to combat fetor of the breath, scraping the tongue every morning, by means of a bone scraper or a paper knife, from the back forward upon the surface of the mucous membrane, while the tongue, enveloped in a handkerchief, is pulled and held outside the dental arch so long as the operation lasts. Thereupon the patient gargles his mouth with deduplicated oxygenated water. I further recommend the cleaning of the teeth with a powder composed of charcoal and quinquinina. By the employment of these means, simple enough in themselves, it is possible to make the fetor disappear. This practice gives good results in uremic stomatitis. Further, in these cases, we may supplement the rinsings with a topical remedy applied to the surface of the buccal mucous membrane. For this purpose we employ mouth washes containing a strong proportion of chlorate of potash; and if their action is insufficient, one need not fear employing paintings with tincture of iodin.

We will now rapidly pass in review the different forms of stomatitis which resemble more or less the one we have studied, and we will indicate the treatment which seems to accord in particular with each form. The ulcerous or ulcero-membranous stomatitis is certainly one of the most important to be mentioned here. This specific and contagious malady is characterized by ulcerations of variable form and extent, capable of developing upon all the points of the buccal cavity, but nevertheless exhibiting a predilection for the gums. We will return to this point. This form of stomatitis is often accompanied by an extremely abundant flow of saliva and extreme fetidity of the breath, as well as a more or less pronounced engorgement of the submaxillary ganglions, which we have not found

in uremic stomatitis. It is only since the labors of Bergeron that we have known ulcerous stomatitis, which formerly was confounded with manifestations of diphtheria. It has been chiefly met with in epidemic form in young soldiers under the influence of overwork and a bad alimentary hygiene. In the hospitals for children it attacks for preference weak and puny subjects. It has also been observed among sailors under conditions more or less analogous to those under which scurvy is developed.

This affection commences with ulcerations, at first superficial, covered with a chalky sediment causing severe pains, which make the patients refuse all solid food. The lesions of this form of stomatitis are predominant upon the gums, especially upon the lower. They are also met with upon the internal surface of the cheeks, more rarely upon the palatine vault, and exceptionally upon the amygdalæ and the tongue. The ulcerations have their seat at the level of the setting of the incisors and the cuspids; they are covered with a coating composed of pus, blood, and sometimes a considerable quantity of dental tartar. The *parietal ulcerations* of the cheeks are at first unilateral, of oblong form, and sometimes circular. The disease lasts from eight to twelve days in benign cases, three weeks or a month in graver cases. Sometimes it is prolonged and becomes chronic. Authors have emphasized the presence in the exudations of a large number of spirilla. Finally its true nature has been elucidated by the labors of the military doctor, Vincent, who has demonstrated that there exist in this malady special bacilli of spindle-shape, from 10 to 12 millimetres in length, strangled at their middle portion, not taking the Gram method of staining associated in more or less strong proportion with the spirilla already described. He has also noted the association of other microbes, such as the streptococcus. Vincent has made a particular study of the *ulcero-membranous angina* to which his name has been attached, but this form does not differ from the stomatitis except in its localization.

The treatment of this form of stomatitis deserves our attention. Formerly chlorate of potash was considered *the* medicament. Indeed, good results were often obtained with concentrated solutions of this substance, but it must be stated that in certain cases this method of treatment was quite inactive. We must therefore have recourse to oxygenated water, and to consecutive paintings with tincture of iodin, repeated morning and evening. One must be

careful in such cases to employ fresh tincture of iodin—that is to say, non-caustic.

I will mention in passing diphtheritic stomatitis, which is sometimes difficult to diagnose, necessitating bacteriological examination, and that of cultures. Roux counsels in this case painting with anodyne, with boricized water or with lemon juice, additional to the employment of injections with anti-diphtheritic serum.

In 1884 I made known *aphthous stomatitis,* which exhibits a benign form, discrete or confluent, and a malignant confluent form. The benign form is easily distinguished from the other buccal lesions: the mucous membrane presents a kind of yellowish depression, formed of very fine elements, the thickness of a pin-head, leaving in their places little ulcerations of the thickness of hempseed, surrounded with a very marked red collaret. This affection causes pain during the act of deglutition, especially when salt or acid food is taken. In the confluent form one is sometimes able to count up to two hundred aphthous elements covering the internal surface of the cheeks, the pharynx, the tongue, and the posterior surface of the lips. The salivation is abundant, but the fetor is less repulsive than with ulcerous stomatitis. The malignant form, which is rare, is accompanied with shivers, great lassitude and faintness, and cephalalgia of a typhoidal character; the patient experiences intense pain, a sensation of burning in the mouth, which rapidly proclaims the diagnosis. Cases of contagion have been observed, not only from man, but from the animal to man. In animals the affection bears the name of "cocotte" (aphthous stomatitis), and is particularly severe in the bovines. Cases of direct contagion have been cited in persons who have tended sick animals, and of indirect contagion through the medium of milk.

The true nature of aphthous stomatitis is not yet quite clear. Pringle has described an ovoid bacillus which he considers the pathogenical agent of the disease. The best treatment consists of irrigations, and especially of painting with strong solutions of 20 per cent of salicylate of soda.

In concluding, I cannot insist too much upon the importance of the examination of the buccal cavity, upon which nearly all the infectious maladies inscribe themselves; let it suffice if I recall to you the manifestations of erysipelas, the ulcerations of the palatine vault in typhoid fever (Duguet), the buccal lesions in infectious purpura,

the eruptive fevers, of tuberculosis, notably in Addison's disease, and finally syphilis. By the side of these manifestations of infectious origin, one may call to mind the stomatitis caused by the intoxications (lead, mercury) and by the constitutional diseases (diabetes). To sum up, if the tongue has been called the mirror of the stomach, we may with as much reason say of the mouth that it is the mirror of most of the infectious diseases and of the general intoxications of the economy.

LOCAL ANESTHESIA AND ITS APPLICATION IN DENTISTRY. Dr. Hermann Thiesing of Leipsic discusses the twelve anesthetics which have been used in stomatology. He finds that acoin, cocain, Alpha-Eucain, holocain, orthoform and orthoform-new are less suited because of their greater toxicity; nirvanin, anesin, etc., because of insufficient anesthetic action and other disadvantages; and that Beta-Eucain should be employed. Dr. Thiesing has also used Wilson's anesthetic, but has entirely ceased to employ it, having become convinced that better results are obtained with a 1 per cent Beta-Eucain solution; moreover, Wilson's anesthetic is fifteen times as expensive as such a solution.

Beta-Eucain possesses greater anesthetic power than tropacocain, while the duration and intensity of the anesthesia, and the area affected by it, are equal to that of cocain. Besides being three and three-fourths less toxic than cocain, Beta-Eucain possesses the important advantage that its solutions can be sterilized with boiling. The author has never observed edemas or subsequent pains from the use of boiled Beta-Eucain solutions, though sometimes, just as with tropacocain, bleedings followed its employment, which, however, have always stopped promptly without aid.

Insensibility of the mucous membrane may be easily produced by the external application of a Beta-Eucain solution. The injection of a 1 per cent solution (to which eight-tenths of one per cent sodium chlorid have been added) at body temperature is absolutely painless, and effects a thorough anesthesia lasting 25 to 30 minutes.

From his investigations Dr. Thiesing draws the conclusion that in dentistry only Beta-Eucain and tropacocain may be considered, and occasionally, if very dilute solutions are to be used, or for application to the unbroken skin, also acoin and cocain. He prefers Beta-Eucain, because it is less toxic than tropacocain and has con-

siderably more anesthetic power. According to the investigations made by various physicians, a 1 per cent Beta-Eucain solution produces about the same effect as a 4 per cent tropacocain solution. The possibility of intoxication is therefore much greater with the latter.

Dr. Thiesing considers it advisable to employ Beta-Eucain solutions of four different strengths for various purposes. He indicates 2-5 per cent solutions for opening abscesses, excising small tumors; extracting loosened (not inflamed) teeth and roots (deciduous teeth), and the four lower incisors; and anesthetizing the inferior alveolar nerve on the lingula and on the foramen mentale; 1 per cent solutions for extracting the upper incisors, bicuspids and molars; straightening teeth by operation; drilling the alveolus, and removing necrotic root apices; 2 per cent solutions for extracting the lower molars and bicuspids and the four cuspids; excavating sensitive dentin; and removing the pulp; and 3 per cent solutions for extracting all teeth and roots in acute periodontitis.

SUBMUCOUS INJECTION FOR DEVELOPMENT OF LOCAL ANESTHESIA. By Henry C. Boenning, M.D., Philadelphia. Increasing numbers of lesions of the maxillæ at my clinic have induced me to make an examination into the histories of such cases, and I find so many references to the use of the hypodermic syringe for the establishment of local anesthesia in these cases of septic conditions about the jaws—septic periostitis and osteitis—that I have concluded they are in part due to the negligence of the operator in failing to establish oral asepsis, as well as to the improper use and condition of the syringe and the solutions employed. In order that an extraction operation be properly done it is first necessary to have everything concerned in the operation surgically clean or aseptic. Not only must the instruments to be employed be sterile, but the field of operation also should be aseptic.

I have on inquiry found in the cases of infected bone sent to me that generally the practitioner fails to follow the requirements of surgical asepsis. He often directs the patient, without any preliminaries, to open the mouth, indicate the offending tooth, and then, without further preparation of any kind whatever, he thrusts the hypodermic needle deeply into the part at various points, and proceeds to fill the tissues with an obtundent. Such surgical procedures

cannot fail to inoculate the patient, and they are reprehensible in the last degree. It is as important to have the mouth clean, and the section operated on aseptic, as it is to employ a clean hypodermic syringe and needle, and an absolutely sterile obtunding solution. Failure to observe these precautions means inoculation of the deeper structures with pyogenic and other microorganisms, which develop and bring about the septic conditions of periosteum, bone and other structures now so frequently observed following the use of obtundents.

The practitioner should observe in extraction operations a regular schedule, which may be spoken of as the *technique of extraction.* Let him after examining a case for extraction have the patient thoroughly cleanse the teeth mechanically, if possible, by means of warm water, castile soap and a brush; in the absence of brush, rinsing the teeth and mouth with warm castile soapsuds may answer, after which the use of peroxid of hydrogen, pure or diluted, is to be recommended. For this purpose a mouthful taken by the patient may by the action of the cheek and lip muscles be flushed about the teeth, and then the parts should be rinsed with a saturated solution of boric acid, all kept conveniently by the chair. The operator should be scrupulously careful to have his hands and nails mechanically cleansed with soap and water; dipped for a sufficient time in an antiseptic solution, and then dried on a sterile towel.

The hypodermic needle should be absolutely sterilized, and after each operation thoroughly cleansed and placed in alcohol containing a minute quantity of bicarbonate of soda. The barrel of the syringe should be clean and likewise treated. The obtundent used should be absolutely clear and sterile. Sterilization is best brought about by placing in an Arnold sterilizer and exposing to a moist heat of 212 degrees F. for thirty minutes. It may then be immediately stoppered, the stopper being similarly sterilized. *Resterilization after use is imperative.*

After the extraction, especially when a local obtundent has been used, great care should be given to oral sanitation. The socket itself, if lacerated in any way, and the parts about it should be washed out with peroxid of hydrogen or boric acid solution. In some cases it is necessary to apply a dressing of bichlorid or boric acid gauze, especially where purulent conditions obtain. Frequent irrigations of the mouth with boric acid solutions will aid in preventing the

development of subsequent trouble. Wherever there are shreds of tissue they should be removed by the use of scissors. Such lacerations often become gangrenous and a culture medium for saprophytic germs. A most important detail—almost never observed—is the duty of the practitioner to see the extraction cases after operation, so as to be certain that the mouth is kept in a clean and as nearly aseptic condition as possible, and that the region of the operation be surgically clean.

Surgical success in dental extracting work does not simply mean skillful leverage by which a tooth is lifted out of its socket—it means more—it means minute attention to details of asepsis; that the mechanical work shall be well done, and that the patient shall recover without any pathological conditions being established other than those incidental to the processes of natural repair.

That dentist fails in asepsis who omits one single detail *in the technique of extraction,* which requires—surgically clean hands for the operator, surgically clean linens and dressings, surgically clean instruments, syringes and needles, surgically clean parts on which to operate, surgically clean conditions in every place, and mechanical skill sufficient to remove the tooth faultlessly.—*Stomatologist, Dec., 1902.*

STATUS OF DENTISTRY. By B. Holly Smith, M.D., D.D.S., Baltimore. Read before the American Dental Society of Europe, 1902. The denial on the part of the medical profession of responsibility, not only for the birth of dentistry, but for its conduct and progress, forced our professional forefathers into the anomalous position of which Topsy stood confessed, an absence of parentage; like Topsy, dentistry of that day "just growed." But as time has worn away the antagonisms and resentments of that early period, we can see dispassionately that we are, like Paul, debtor both to the Greek and the barbarian; to medicine, with all its ancient traditions and assumption of authority, and to the various branches of mechanics and arts which have fostered and developed metallurgy and general manual dexterity.

May it not be profitable to-day to examine into the state of health and sources of vitality of this youth, who has given promise of that virility so often found in the illegitimate, and to inquire into the expediency (now that we have in part lived down the shame (?) of our early years) of accepting the parental overtures of the medical

profession, and by changing our name inherit the respectable estate and honorable title of M.D.?

It is a well-known fact that nearly if not all the men instrumental in the establishment of the degree of D.D.S. were medically educated, if not the proud possessors of the medical degree. They brought to the training of the dentist minds well stored with a knowledge of the anatomy, pathology, therapeutics and surgery of their day, with the advantage in their interpretation that always accrues to the one who is accustomed to doing things with his hands. In many instances these men were linguists and scholars, translating and adapting for dental uses important treatises on surgery and therapeutics. Unquestionably this had the advantage of profoundly impressing the beginners with a wholesome respect for the dignity of the new profession. The rapid improvement in methods of practice was but a natural consequence of the régime which substituted clinics for the closed laboratory door, the college with its attendant courses of lectures for the unsatisfactory system of pupilage, the dental society and dental journal for churlishness, unsociability and secrecy.

Reviewing the history of these cognate influences for the establishment of our young profession, it is a striking evidence of the vitality of the movement that while error and ignorance are often apparent, there is also abundant evidence of marked ability and untiring energy. Prejudice and secrecy were met with a candid and scientific demonstration of principles, and it is not unreasonable to say that without the aid of precedent and with very little if any encouragement from the profession of medicine, the progress of dentistry in the early days was quite as rapid and gave quite as much evidence of the scientific, artistic and ethical spirit as was to be found in any profession of that era. Later dentistry far outstripped medicine in improvements of methods of practice and adaptation of arts in the alleviation of oral ills. For a long time medicine did not recognize either the lusty and vigorous growth of this youngster or take advantage of the improved methods of treatment. In fact, it is only of very late years that medical men have openly acknowledged the authority of the dentist over his special field or been willing to profit by his superior skill and knowledge in surgery and therapeutics in that field. That this concession finally has been made, and made for all time, there is now no question.

As this brief review of the beginnings of professional dentistry finds us in America, it should not be uninteresting to state what is the condition of affairs in American dentistry to-day. Most of us know the existing conditions, but let us think them over together, examine into their causes and see if they deserve to be perpetuated, or even if they may serve as a satisfactory foundation upon which to build the ideal organized dentistry for to-morrow. It is doubtful whether it is to be considered fair, without some involvement of the very recent past, to hold dentistry up at the point of a gun, as it were, and demand its status. The answer, if honest, might be like that of the youth who, asked for his age, replied he was thirteen at home, fourteen at school and eleven on the cars. If we can get at some such shifting though approximate scale, let us be satisfied.

The degree of D.D.S. is not possessed by all the creditable practitioners of dentistry in America. Some of the older ones have the M.D.; quite a respectable minority that of more recent origin, D.M.D.; but the bulk of practitioners claim their right to practice because of their D.D.S. While many of these have in addition the M.D., the special degree is the authoritative one, as few of the M.D.'s do more than practice their dental specialty, leaving, as do other specialists, the treatment of conditions outside their immediate field to the general practitioner or other specialist. In fact, even though the dentist has the medical degree, he cannot prescribe for ailments outside his special field unless he has conformed with the law of his state by registering, which often requires him to pass an examination before a board of medical examiners. All, therefore, are driven to the acceptance of the rights and privileges conferred upon the D.D.S., and while these appear to have been ample, some few aspiring ones, restless of possible infringement and jealous lest honor and dignity be denied them, have contended for the right of the dentist to practice all the specialties and general medicine included; indeed, they have advocated spurning the special degree, with its limited privileges, and the substitution of the M.D., with all its wealth of opportunities for excursions upon the various surfaces and into the many orifices of the human body.

The newspapers report Mr. J. Pierpont Morgan to have replied to some visionary aëronaut, who desired his assistance in the establishment of a line of airships to the moon, that this earth is quite enough for him, and so we say to the excursionist in dentistry who

attempts to discredit the D.D.S.: The field of practice is sufficient and the authority ample, both at home and abroad.

The American M.D. has no advantage in foreign lands over the D.D.S. and at home the medical profession has adopted restrictions identical with those of dentistry. It has associations of faculties and examiners, and their degree, if reputable, entitles the holder to be examined for the right to practice; ours does no more, no less. Their most thorough practitioners do not attempt to practice dentistry, nor is there time or opportunity for us to practice general medicine. More than this, there is no degree which could be secured in any reasonable time, purporting to qualify the holder to practice general medicine and dentistry, which would not soon be discredited by both medical and dental men. Again, there is no specialist, however broadly trained in general medicine, who, following assiduously any specialty, can keep up with the changes in general practice or improvements in the technique of general medicine. We therefore fail to see the force of the arguments of those who contend for a change or the advantages to be gained by such a course.

The special degree stands only for the special training, and anyone who is familiar with the training of the student in the average medical college, or is acquainted with the meager knowledge of oral conditions and diseases which such student has when he is graduated, must recognize the necessity of this special training. Experience teaches that the medical graduate who essays to study dentistry makes often a comparatively poor showing in the mechanical part of his course. There is more than one reason for this, but the advantages which students have in the theoretical branches are often overbalanced by their lack of manual skill, and their ultimate success is not at all commensurate with the time and labor spent.

America stands foremost in the world to-day in the domain of mechanical arts, and American dentistry, through its kinship with them, may fairly claim part of this supremacy. The peculiar life incident to a new country like ours enforced upon its youth a familiarity with mechanics—or rather, the way to do things with their hands—that has in the past lessened the necessity for emphasis upon the importance of special training of the motor centers. Now, however, that the field of education is broadening and deepening, and an increased number of years is required in general educational work, it behooves our profession to look well to its interests, lest our one-

time expertness in the use of tools and general manual excellence be lost or crowded out.

Boys expecting to enter our profession should receive manual training between the ages of twelve and twenty, if they are to develop a skill commensurate with that of their dental forefathers. With such testimony as educators everywhere bear, not only to the value of manual training as a preliminary to special study, but to the benefit to be derived from it in broadening the comprehension, giving students the power of taking hold of questions at the right point, and by developing the motor centers of the brain and coordinating the movements of hands and body, thereby creating a more symmetrical and better rounded man—I say with these things proven, there is no force in the contention that specializing in preliminary work tends to narrow the individual. There is no reason, either, why manual training need displace any other necessary branch, as the testimony is convincing that in institutions where its pursuit has been optional the students taking it did in other studies as well as or better than those who declined it. Such institutions are being multiplied, showing both popular demand and a willingness on the part of educators to satisfy and encourage it.

The questions at issue between the rival camps in the dental field to-day seem to be: "Shall the scope of dental practice be changed? Do we regard dentistry as it is most successfuly practiced to-day as failing to measure up to its opportunity? Are we to undertake any change that will abolish the necessity for manual dexterity?". Our practice in the main is surgical rather than medical. There may be an opportunity for specialism along the line of application of medicaments to oral lesions, but the average practitioner does not have enough practice in the application of general medicine to diseases of the mouth to become proficient in it. Dependence must therefore be placed in the practice and traditions of specialists, or patients must be referred to the specialist. Instance the treatment of such diseases as pyorrhea alveolaris; the principal success attendant upon its treatment results from the skill and dexterity with which the surgical portion is accomplished. So in diseases incident to the apical space, frequent medication does more harm than good, and the advantage of the modern treatment lies in the fact that surgery has been substituted for medicine. The success or failure of the dentist to-day, and the measure of his usefulness to the world at

large, depend chiefly upon his ability or lack of it to practice the art of dentistry, and to train him to do this requires a course of pupilage unlike that which is required for any other calling and quite distinct from that of medicine.

There is no reason why students preparing to begin the study of dentistry should not approach it armed with an academic degree, conferred by an institution in which manual training, physics, metallurgy, chemistry and laboratory work form a part of the curriculum. It is only necessary for the profession to decide how much of these is necessary or desirable. When the ideal course is determined, institutions will be found in which such a course can be pursued. No experienced dental teacher has failed to be struck with the almost hopeless confusion of the freshman student. He spends much of his first year in making excursions into the various branches of study, appalled, overawed and totally at a loss to know how to begin. His time is lost because he does not know how to approach his work, while a student with the preliminary training indicated would possess decided advantages. A saving of time is accomplished thus, and with the ever-increasing demands the tendency of to-day is for the young man to begin his life-work at too advanced an age, especially should he attempt post-graduate work after he has secured his degree. If the men of our profession are to accomplish anything in the line of original research, it must be hoped for through post-graduate work and study. The preliminary and special training can but be the introduction to this.

The special training given in our best dental colleges seems to be measurably satisfactory. The goads which are being applied constantly to the teaching institutions by the National Association of Dental Faculties and the Boards of Examiners may be depended upon to keep them abreast of the times in their instruction and equipment, but the matter of preliminary and post-graduate work needs our encouragement. The future rank of the dentist among scientific men will depend upon the aid the profession is willing to give before and subsequent to his special training. Is it too much to hope that in these ringing times of progress our specialty may strengthen its boundaries, equip itself with every advantage and perfect its work, whatever its scope, rather than with dreamy eyes and envious vision neglect the present for the doubtful hereafter? —*Review.*

Letters.

THE BOSS HAS ONE OF HIS GROUCHY FITS.

(AS TOLD BY THE OFFICE BOY.)

I kin stand most of the Boss's Humors, but when he gits to tellin' how mutch better Old Times ust to be than things nowadays I git attacks of Lumbar Vertebra. He got a start thataway, this mornin'. Says he, "James, ef things would only be the same in Dentistry as they ust to be in the Dental College Days. My! As a student I got the Idee that Dental Practice was one Joyous Round o' fillin' teeth with Gold, makin' Gold Bridges, an occasional Gold Plate, an' shovin' a Hunderd an' Fifty Dolers into the Safe an' lockin' it up at 5.30 P. M. Them was Halcyon Days, James, an' the most onpleasant part of it wasn't by no means the talk of your Feller Students about what a Rattlin' Fine operator you was, an' how you was bound to be the Wonder of the Perfession, when you come to Open a Office. I got my share o' that, James. In fact I come within one of bein' the Valedictorian of our class. Jis' barely missed it, indeed. Think o' that, James! Me the Valedictorian! I shudder to think o' my Narrer Escape."

"Them was Gala Days, James. Six er seven of us students was way up in High G when it come to operatin'. We was the envy of our Less Gifted Feller Students. They'd come an' look on Reel Respectful while we was Operatin', an' tell us we'd orter be Proud of ourselves, an' how the College orter be Proud an' Honored, an' the talk would be that a Mass Meetin' of the Citizens was likely to be Called, to pass resolutions an' take action lookin' to some Substantial Memorial to commemorate the year us Fellers was Students in their Midst."

The Boss closed his eyes, an' set Enraptured, recallin' the Scenes of the Past. "Most of us Prize Fellers reely did Turn Out not so bad, James. There was Dock Ighpolish, an' Dock Dulfinish, an'—well, myself, James. Dock Ighpolish he filled a Tooth fer the President once, an' it give him a National Reputation, though I understand he was sued lately fer a Dental Depot bill. Dock Dulfinish he got interested in breedin' Fancy Dogs, an' he got so he didn't give his fillings no kind o' Finish, an' said he didn't care, an' so after a Spell he worked out o' Dentistry, an' nobody knows

whether he'd orter be counted a Success er not. My own Private Feelin' is, James, that he's a Traitor to the Perfession."

The Boss he paused, an' he went to the Hall Closet, an' took a dose o' some new kind o' Yellow Medicine he keeps in the bottle that ust to have the Poke-Berry juice in it. "Then there's me, James," says he, takin' another Long Pull, "I ain't ben so Well Advertised as some o' the others, but I've Rose to some Eminence. I'm Distinguished fer takin' as low as Seventy-Five cents fer a Gold Filling, an' I'm the only dentist in the State that ever has Dull Spells in Practice. I've been pertick'lerly Illustrious fer Warrantin' my Fillings fer Ten Years, an' havin' my Patients go me one better, an' make it Twenty Years. These is all Empty Honors, James, an' you mind, when you git in Practice, don't you cultivate 'em." So I promised I wouldn't.

"Ah, them Dental College days, James. Things was so Different them days. You wouldn't never believe me, James. You know how it is here. Patients will come in an' have a Nerve Killed, an' later I'll remove it an' fill the roots, an' it'll go on achin' the same as ef I hadn't done a Blame Thing."

"Yessir," says I, "an' you a-cussin' and snortin'."

"Hold on, James, I don't do thataway, never, an' you know it. That ain't got nothin' to do with the matter. I say, I'll put Ten Dolers worth o' work on the Tooth, an' it'll go on Achin', an' finally I'll haf to pull it out."

"Yessir."

"An' I'll find a Dentigerous Cyst as big as your Hat on the end o' the Root, showin' it had orter been pulled in the first place."

I nodded, showin' I'd felt the loss o' the Ten Dolers almost as keen as he had.

"Well, nothin' o' the sort ever happened in the Dental College clinics, James. Patients that come there seemed like they'd been made to order expressly fer the comfort an' convenience of Dental Students. They all had Big Mouths, Hard Teeth, with cavities of decay susceptible of bein' shaped so as you could easy fill 'em accordin' to Book. In a Dental Office you know it's different, James —little Sucker Mouths you can't hardly Pry Open wide enough to slide in a Gum Drop. As fer Extension fer Prevention, you wouldn't have to give that Problem no consideration, James. In Dental Office practice the "Extension" part is usually 'way past the limit,

already. An' it ain't so much to the p'int how you'd orter shape your Cervical Border, as it is to find any cervical border."

"Then in office practice there's the Sneakin', Miserable little superficial cavities under the gum, so sensitive it sets 'em to achin' to reflect the light from a Mouth Mirror on 'em. Cavities that doesn't seem to amount to much, an' the Patient is in a hurry to git to the Matinee, an' you say, 'Oh, that's all right; we'll fix this in five minutes, easy.' Then you start in' an' the cervical border of that cavity seems to Sneak Back higher an' higher out o' reach—like promisin' to pay a bill next Week. The gum starts to bleedin', an' you tell her not to git Impatient, an' you apply Tri-Chlor, an' Monsel's solution, an' then you send over to Dock Peabody an' borry all his Styptics, an' that Blame Gum jis' bleeds an' bleeds. You feel your Gall swellin', an' finally you say, 'I reckon I'll have to see you at another hour, about this.' So you see her seven other hours, an' you find exposed nerves, an' pulp stones, an' everything from mumps to elephantiasis the matter of that tooth, an' when you git all through, she can't pay only Two Dolers, 'cause she's only a Type-Writer, an' a whole family dependent on her."

"James, I say, the patients in the Dental College was the kind to swell a dentist's heart with Pride; patient, obligin', long-sufferin'—er at least, long-endurin', you'd hardly imagine they suffered any. They'd take the Deepest Interest in New Appliances; Clamps, Separators, Nerve Broaches, an' so on, an' they'd insist on your goin' on an' usin' the whole Output at once, like they wanted to git their Money's Worth. There they'd set, hour after hour, never stirrin' a Muscle, never so mutch as Peepin' about any engagement with the Dressmaker er some man at the Store. Every few Hours they'd ast you hadn't you orter rest a Spell; smoke a Segar, er refresh yourself with a Stein an' a piece o' Limberger. Then you'd Come Back invigorated fer a Fresh Spiel, an' you'd rasp away at a Filling with a Two-Yard strip of Carborundum Tape, an' git the filling Red-Hot, an' the patient would Smile, an' say it felt good, an' please do it some More."

"Sech experiences, James! I kin never ferget the spectacle of a patient settin' Clam an' Composed, slowly smotherin' to Death under a Rubber Dam as big as a Hall Rug, with a Clamp diggin' into the Gum about a Wisdom Tooth, an' a student rammin' a Broach into a Live Pulp. Patients seemed to enjoy the privilege o' helpin'

students up the Hill o' Knowledge, as concerned Dental Science. They had the true sperit; a disposition to sink Theirselves an' their Petty Woes out o' Sight, in view of the Lofty Aspirations of the Students. Settin' here an' recallin' it all, I kin easy imagine myself back there in the Dental College, James, earnin' a Hunderd Dolers a day (in my Mind), an' a Rosy Future beckonin' me." The Boss hove a Deep Sigh.

"As I regard the matter at this Late Date, James, there is reason to Suspicion that the Dental College Faculty set up a Job on us Students, fearin' lest we might some o' us git Discouraged, an' go back to Clerkin', er the Farm. In my Opinion, them patients was all a Picked Lot, selected fer their Good-Nature, Endurance, Quality of Teeth, an' in all probability subjected to months o' Trainin' designed expressly to qualify them fer the Job o' Beguilin' students into the Notion that Dentistry was a Picnic. Hired at a Big Premium fer that very purpose, I haven't a Doubt. You can't account fer the way patients in the College acted on no other Hypothesis. I ain't never met one o' the kind in my Office; ain't heered of no other Dentist meetin' one. Dock Puffy he claims to reduce all patients to similar conditions, but he does it by Catephoresis, invariably gittin' Magic Results inside o' Five Minutes, instid of the Five Hours I've had to administer it, an' then no great shakes as to Results. That ain't got no Bearin' on this case, though. Most of my patients, you know, James, is so Easy Hurt that they'll jump an' Yell ef I punch a hole in the Rubber Dam, in the operatin' room where they are. An' as fer enjoyin' New Appliances, they'll Faint ef I show them a Capsicum Pad. When I'm tyin' on the Dam, they'll git pale an' ast faintly, 'ain't the tooth most ready fer the Gold.' Mebbe that'll come right on top o' me an' Mis' Contour's havin' had a Wash-Mornin' Seance over a busted Water Pipe, an' me in no Angelic Humor nohow, James. Then I'll have to Look Pleasant an' Happy, no matter what that Patient does er says, especially with Ritch Patients, an' so I'll set about to say Soothin' Things, an' I'll use a Drug-Storeful o' Pain Obtundents, an' spend two hours preparin' the Cavity, the patient squirmin' all the time. She'll squirm up, with every stroke of the Mallet, an' down, with every fresh strip o' Gold stuck on, an' when at last I take the Dam off, she'll give me a Look that'll suggest I'd better prepare fer a call from her Big Brother, mighty quick. She'll git Hystericky, an' as she Goes Out

the door she'll say, without lookin' back, that's the last tooth any Dentist ever gits a Chance to fill fer her—like I'd set up a Job on her an' made her have it Filled! She'll come back presently, in company with a Friend, after her Rubbers that she's fergot, an' her Bag, an' her Comb, an' her Handkerchief, an' them two will look Daggers at me. I'll hear later, that she told her Friend it didn't reely hurt a Bit, only she was afeard it was agoin' to. I won't git my Pay, an' months later I'll git a call from Dock Peabody, an' he'll tell me how he had to kill the nerve in that tooth fer her, an'. I'd orter learn to be more careful with nervous patients like her. without I want to lose all my Practice, an' he'll offer to Learn me how he would of done in the case, ef I want him to. Then about six months later I'll find out it wasn't the tooth I filled that give her the Trouble, but the one next to it, that Peabody himself filled, an' saddled the blame on me. When I go over to see him about it, he won't deny it, but he'll give me the ha-ha, like it was a Rattlin' Good joke!"

The Boss's eye glinted Fire, as he recalled all this, an' jis' then Mis' Contour called fer him to come an' help her hang pictures.

Cincinnati, O. FRANK W. SAGE, D.D.S.

ORTHODONTIA: DEPRESSING TEETH IN THEIR SOCKETS.—After years of observation I have come to the conclusion that it is better to grind off interfering front lower teeth than to run the risk of disturbing nutrition of the pulp by compression. It does no harm whatever to grind the ends of such teeth if it is done carefully. If they are sensitive it should be done a little at a time with intervals of several weeks between.—J. N. FARRAR.

SCALE OF PROFESSIONAL ENVY.—An Italian philosopher has amused himself by constructing a scale of degrees for the measurement of professional envy. The highest point in this envy measurer is 10. Architects are happily placed lowest on this scale. They register only 1. Advocates and priests and military men are ranged at 2, and in the ascending scale he gives us professors of science and literature, 4; journalists, 5; authors, 8; actors and actresses, 10. The small amount of envy among architects is held to be due to their precise, severe and rigid studies. The same thing applies to advocates. Among the clergy envy is found mostly in preachers. In the military career envy is quiescent in time of peace, but can become acute in time of war. Envy makes men of science and literature lead solitary lives, diffident of each other. Among physicians envy is still more prevalent, and they do not spare their colleagues, often calling them charlatans. In the theatrical world envy, according to Signor Ferriani, reaches the acute form, vanity playing a great part in its production.

The Dental Digest.

PUBLISHED THE FIFTEENTH DAY OF EVERY MONTH
At 2231 Prairie Avenue, Chicago,
Where All Communications Should be Addressed.

Editorial.

NEW DENTAL LAW FOR ILLINOIS.

We print below a bill recently introduced at Springfield by Senator Clark and Representative Boulware, and take pleasure in saying that so far as our knowledge extends all who have considered this bill are unanimous in their praise of its every provision. The existing dental law was enacted in 1881 and amended in 1899. It has been better than no law, but is not as effectual as the public interests demand. The great value of a just and efficient dental law is the protection of every citizen of the state who comes in contact with the dental profession against charlatanism and quackery from persons claiming to be dentists and who ply their arts in the profession without any adequate qualifications or fitness to practice.

One of the cardinal virtues of this bill is that every candidate desiring a license to practice dentistry must submit to an examination by the State Board of Dental Examiners. This is as it should be. Every applicant will then be judged on his merits, and the public will know and understand that his license entitles him to their confidence. This provision of the proposed law, it is believed, will not only produce better results, but is more democratic, in that all those aspiring to enter the dental profession will have an equal chance, the sole test being one of merit and qualification.

Under the present law, by the ruling of the Attorney-General, this is not permissible, as only certain classes of persons are eligible to take the examination. Under the existing Act, as is widely known, many scandals have reproached the state by the sale of certificates of degrees by disreputable colleges. This evil, it is believed, will be remedied by the system of examinations where merit and not a certificate of degrees must be the passport.

One of the wise provisions of this bill is that the state keeps its hand upon the dental colleges by providing that the Board of Dental Examiners may at all times know of their methods of instruction,

demonstrations, course of lectures, qualifications of their faculty, and the educational standard of fitness required for matriculation. It will do away with the contention and warfare which have provoked so much trouble in the past between fake dental colleges and the Board.

This bill, if it becomes a law, will undoubtedly become fruitful of the greatest good in providing ways and means for the Board to drive out a lot of disreputable practitioners of dentistry that infests the entire state, and nowhere are they thicker than right here in the City of Chicago. This the Board is now and has been heretofore unable to do by reason of the fact that the present statute provides no sufficient resources for the ferreting out, detecting and prosecution of the guilty parties—those who practice without license and have not sufficient qualifications to pursue the profession of dentistry.

It is hoped this bill may pass both houses of the legislature and become a law. It will then be a great protection to the people and a credit to the state, the legislature and the name of dentistry in Illinois.

43d Assem. SENATE—No. 158 Feb., 1903.

1 Introduced by Mr. Clark, February 17, 1903.
2 Read first time, ordered printed and referred to Committee on License and Miscellany.

HOUSE—No. 263

1 Introduced by Mr. Boulware, February 17, 1903.
2 Ordered printed and referred to Committee on Judiciary.

A BILL

For an act to establish a State Board of Dental Examiners, and to prescribe its powers and duties, and to define and regulate the practice of dentistry and dental surgery in the State of Illinois, and to repeal all existing laws heretofore enacted to regulate the same, which may be in conflict herewith.

SECTION 1. *Be it enacted by the People of the State of Illinois represented in the General Assembly:* That a board of examiners, to consist of five practicing dentists, *to be known as the Illinois State Board of Dental Examiners,* is hereby created, whose duty it shall be to carry out the purposes and enforce the provisions of this act, *as hereinafter specified.* The members of said board shall be appointed by the Governor, and *at the time of their appointment to membership upon said board must be actual residents of the State and must be legally licensed to practice dentistry or dental surgery in this State. Provided, however, That no person shall be eligible to appointment on said board who is in any way*

pecuniarly connected with or interested in any dental college or dental department of any institution of learning. The term for which the members of said board shall hold offices shall be five years, *provided, that the members of the dental board in office at the time of the passage of this act shall be permitted to serve out their respective terms of office for which they were appointed, and until their successors shall be duly appointed. In case of a vacancy occurring on said board, such vacancy shall be filled by the Governor.*

Section 2. Said board shall choose one of its members president and one secretary thereof, and it shall meet at least once in each year, *and oftener if necessary, in the discretion of the board,* and at such times and places as it may deem proper. A majority of *the members of the* board shall at all times constitute a quorum, *for the transaction of the business of the board,* and the proceedings thereof shall at all reasonable times be open to the public inspection.

Section 3. It shall be the duty of every person who is legally engaged in the practice of dentistry *or dental surgery in this State at the time of the passage of this act,* within six (6) months from the date of *such* passage, to cause his or her name and residence or place of business to be registered with the *Illinois State Board of Dental Examiners,* who shall keep a book for that purpose. *Provided, that nothing herein shall be so construed as to require any dentist or dental surgeon, who was previously registered as such under prior laws of this State, to register a second time.*

Section 4. *No person, unless previously registered and legally authorized or registered in accordance with the provisions of section three of this act, shall practice dentistry or dental surgery, or any of the branches thereof, in this State, without first applying for and obtaining a license for such purpose from the Illinois State Board of Dental Examiners, as hereinafter provided. Application shall be made to said board in writing and shall in every instance be accompanied by the examination fee of twenty ($20.00) dollars, together with satisfactory proof that the applicant is of good moral character and that such applicant is at least twenty-one (21) years of age at the time of making the application. Applications from candidates for examination who shall desire to secure a license from said board to practice dentistry or dental surgery in this State shall also be accompanied by satisfactory proof that the applicant so applying for a license possesses the necessary qualifications to be prescribed by the board. When such application and the accompanying proofs have been inspected by the board and found to comply with the foregoing provisions, the board shall notify the applicant to appear before it for examination at a time and place to be fixed by the board and stated in such notice from the board to the applicant to appear before it for examination. Examination may be made in whole or in part in writing by the board, and shall be of a character sufficiently strict and practical to test the qualification of the applicant to practice dentistry or dental surgery. All examinations provided for in this act shall be conducted*

by the board, which shall provide for a fair and wholly impartial method of examination.

Section 5. *Said State Board of Dental Examiners shall have the power to make all reasonable rules and regulations governing dental colleges applicable to all colleges alike, to inquire from time to time into the management, courses of study, educational requirements and methods of any dental college within this State; and the qualifications of its Faculty* and the character and educational qualifications of all persons received as *students in any dental college in this State.*

Section 6. *Any person shall be regarded as practicing dentistry or dental surgery within the meaning of this act, who shall keep or continuously occupy a room or office with the word "Dentist" or "Dental Sugeon" inscribed, posted or painted upon the door, window or outer wall of such room or office, or who shall treat or profess to treat any of the diseases or lesions of human teeth or jaw, or extract teeth, or prepare and fill cavities in human teeth, or correct the malpositions thereof. Provided that nothing in this act shall be so construed as to prevent regularly licensed physicians or surgeons from extracting teeth or performing surgical operations.*

Section 7. *It shall be unlawful for any person to practice dentistry or dental surgery or perform any dental operation whatever under the protection of another's license.*

Section 8. Any person who shall be or shall have been licensed to practice *dentistry or dental surgery in this State by the Illinois State Board of Dental Examiners, as hereinbefore provided, shall personally and without delay cause such license to be registered with the County Clerk of such* county or counties in which such person desires to engage in the practice of dentistry or *dental surgery,* and the county clerks of the several counties of this State shall charge for registering such license, a fee of twenty-five (25c) cents for each registration. *And it is hereby further provided, that every person who engages in the practice of dentistry or dental surgery in this State, shall cause his or her license for that purpose obtained from the Illinois State Board of Dental Examiners to be at all times displayed in a conspicuous place in his or her office wherein he or she shall practice such profession, and shall further, whenever requested, exhibit such license to any member of the Illinois State Board of Dental Examiners, or his duly authorized agent.*

Section 9. The board may refuse to issue the certificates provided for in this act to individuals who have by false or fraudulent representation obtained or sought to obtain practice in their profession, or by false or fraudulent representation of their profession have obtained or sought to obtain money or any other thing of value, or who advertise under names other than their own, or for any other unprofessional or dishonorable conduct, and the board for like causes may revoke such certificates and the certificates provided for in this act.

Section 10. *Any failure, neglect or refusal on the part of any person obtaining a license to practice dentistry or dental surgery from the Illinois State Board of Dental Examiners to register such license with the county clerk of some county in this State, as above* directed, for a period of six (6) months *from the date of granting of the same,* shall work a forfeiture of *such* license, and no license, when once forfeited, shall be restored, except upon payment to the said *Illinois State* Board of Dental Examiners of the sum of twenty-five ($25) dollars as a penalty for such neglect, failure or refusal *to register such license.*

Section 11. In case of the loss of any license, after once having been legally issued by the Illinois State Board of Dental Examiners, by fire or other unavoidable accident, said board shall, upon satisfactory proof of such loss, issue to the former holder thereof duplicate of such license upon the payment to said board of a fee of five ($5) dollars for issuing such duplicate license.

Section 12. In order to provide the means for carrying out and enforcing the provisions of this act, the said Illinois State Board of Dental Examiners shall charge each person applying to them for examination for a license to practice dentistry or dental surgery in this State an examination fee of twenty ($20) dollars, and, in addition thereto, a license fee of five ($5) dollars for every license or duplicate license issued by said board, and out of the funds coming into the possession of the board under the provisions of this act the members of said board shall each receive as compensation the sum of ten ($10) dollars for each day actually engaged in the duties of the office and all legitimate and necessary expenses incurred in attending the meetings of said board, *provided,* that the secretary of the board, for the purpose of enforcing the provisions of this act, shall receive a salary to be fixed by the board, instead of the per diem of ten ($10) dollars. All expenses shall be paid from the fees and penalties received and recovered by the board under the provisions of this act, *provided,* that no part of said expenses shall be paid out of the State Treasury. All moneys received in excess of said per diem allowance and other expenses herein provided shall be held by the secretary of the said board as a special fund for meeting expenses of said board, and said board shall make an annual itemized report of its proceedings to the Governor by the fifteenth day of December of each year, together with an account of all moneys received and disbursed by them pursuant of this act.

Section 13. Any person practicing, attempting or professing to practice dentistry or dental surgery, or who shall fail to comply with any of the provisions of this act, shall, for each and every instance of such violation or failure to comply with the terms of this act as hereinbefore specified, forfeit and pay to the people of the State of Illinois for the use of the Illinois State Board of Dental Examiners, the sum of one hundred ($100.00) dollars. for the first violation or failure to comply with the terms of this act, and two hundred ($200.00) dollars for each and every

subsequent violation or failure to comply with this act, the same to be recovered in an action of debt in any court of competent jurisdiction.

Section 14. Upon conviction of a violation of or a failure to comply with any of the provisions of this act, the court shall, as a part of the judgment, order that the defendant be committed to the common jail of the county, wherein such conviction was had, until the fine and costs are paid, and, upon failure to pay the same immediately, the defendant shall be committed under said order, for the first violation not more than thirty (30) days, and for each subsequent violation not more than ninety (90) days; provided, that either party may appeal in the same time and manner as appeals may be taken in other cases, except that where an appeal is prayed in behalf of the people of the State of Illinois, no appeal bond shall be required to be filed, whether the appeal be taken from a justice of the peace, or from the county or circuit court, or from the appellate court. But it shall be sufficient in behalf of the people of the State of Illinois, for the use of the Illinois State Board of Dental Examiners, to pray an appeal, and thereupon appeal shall be had without bond or security.

Section 15. Any person filing or attempting to file as his own the diploma or certificate or license of another, or a forged affidavit of identification or qualification, shall be deemed guilty of a felony, and, upon conviction thereof, shall be subject to such fine and imprisonment as are made and provided by the statutes of this State for the crime of forgery.

Section 16. An act to insure the better education of practitioners of dental surgery, and to regulate the practice of dentistry in the State of Illinois, approved May 30, 1881, and in force July 1, 1881, and all other acts and parts of acts amendatory thereto, inconsistent with this act, are hereby repealed: *Provided, however,* that such repeal shall in no wise affect any suit, prosecution or court proceeding pending at the date of the passage of this act.

ANNIVERSARY MEETING OF THE ODONTOGRAPHIC SOCIETY OF CHICAGO.

In days of yore the life of the strenuous martyr who sought to become a dentist compared favorably with that of the printer's devil. Weary days and many months must be spent behind the closed doors and in the sacred precincts of the established practitioner. Then, to gain broader knowledge, the yearling must up and away to another goal to beg or steal the manipulative skill of other clever hands, until he himself had the nerve and the "tuppenny bit" to procure a pickaxe and a saw and establish himself in quarters of his own and wait.

How different is all this from what the limelight disclosed to those

who were in attendance at the fifteenth anniversary of the Odontographic Society of Chicago. A twelfthmonth ago the idea of inviting the dentists throughout the United States to help celebrate this anniversary was broached, and hardly a week has passed since in which a meeting of the rank and file of those who were to bear the brunt of the labor of this undertaking has not taken place. There must needs be but one goal to look towards—SUCCESS, and this was emblazoned all over February 16 and 17, 1903.

One hundred thousand pasters were put in willing hands to adorn every conceivable form of mail matter during the summer and fall. Later twenty-five thousand preliminary programs were spread broadcast throughout the land. Every dental society in the United States that it was possible to reach was communicated with several times. Several notices were sent to all the dental journals, and a number of the latter contributed editorial comment as well. In this way the date of the meeting was kept uppermost in the minds of those whom it was desired to interest, and through this means the brains of the dental profession were appealed to.

From the very beginning the cooperation of the fraternity, not alone in Chicago but throughout the United States, was of such spontaneity as to bring closer the ties that bind. To this nucleus was added the long, strong pull of those appealed to, and as the wheel rolled on it gathered momentum. The generous support of the commercial houses, together with that of the exhibitors of new and novel appliances, cleared the atmosphere of a knotty problem in finance.

The program tabulated 103 clinics and five essays, and there were several others who responded who were too late to have their names appear on the program. To greet these clinicians and essayists over 2,700 representatives of the profession were in attendance. The hearty response of this throng that welcomed the clinicians, handicapped as they were in such a crowd, was an excellent demonstration of the desire to "get some learn." Surely the man who used that part of his anatomy which lies above his ears did not leave the hall without adding to his store of knowledge. Many is the day and many the trip o'er land and sea before there will again be found such an abundance of material for study as was presented by the essayists at this meeting.

Now for whom was all this effort made? For you and for me.

We of Chicago who were banished from the program are surely grateful to those who were on the list and who did so much toward making this the greatest of meetings in the history of dentistry.

And the banquet! There were about 500 around the board, and when Old Glory was saluted the lusty throats made the welkin ring for twice that number. The toasts were responded to from the four points of the compass. It was an inspiration to have been in it, to have been of it, and to have seen it.

With the passing of this anniversary we may turn back with satisfaction to the thoughts of this meeting, for though we study hard the appliances and look well into the new methods, it is men who make the profession, not mechanics.

Vive la Societé Odontographique de Chicago.

W. G.

Tooth in Her Lung.—William T. Gardner reports this case. His patient was a woman, aged 29 years. She was troubled with a very irritable cough, which was constant day and night. No treatment relieved it. She had recently had an attack of pleurisy. She had a sharp hemorrhage and the sputum was bloody, although no tubercle bacilli were ever found in it. Her temperature was that of a typical phthisical case. After some months a very careful inquiry into her previous history discovered that she had within that year had nearly all of her teeth extracted under chloroform. The writer became convinced that she had swallowed a tooth at this time. The Röntgen rays failed to discover any foreign body in the lungs. Several months afterwards the patient coughed up a ragged crown of a tooth, and since that time her symptoms have gradually improved.—*Brit. Med. Jour.*

Unnecessary Retention of Teeth.—L. P. Haskell, in *Review.* There are many cases of retention of natural teeth, either by unwise advice of the dentist or by the persistence of the patient, who does not realize the necessity for extraction. When the patient has reached the condition where an artificial denture is an absolute necessity, if the extraction of certain remaining teeth is essential to make the denture the most useful and comfortable, the dentist should advise their removal. Often the cuspids are the only teeth remaining and the dentist advises their retention to preserve the expression, but this can be restored if the operator knows how by making the artificial gum higher and fuller over the cuspids than elsewhere. By allowing the natural teeth to remain the result is a weak denture and one that is not as firm as where the plate encloses the entire ridge. The recession of the gum from the necks of the cuspid teeth renders it difficult, if not impossible, to harmonize the artificial with the natural gum in such cases.

News Summary.

R. G. EATON, 60 years old, a dentist at Manchester, N. H., died Jan. 31, 1903.

C. E. WILLIAMS, a dentist at Bartley, Neb., died Feb. 4, 1903, of pneumonia.

E. S. POWERS, 63 years old, a dentist at Brockton, Mass., died Jan. 31, 1903.

F. W. BLOMILEY, for several years a dentist at Sioux Falls, S. D., died Feb. 1, 1903.

M. P. BEECHER, 52 years old, a dentist at Brooklyn, died Feb. 5, 1903, of Bright's disease.

G. H. CUSHING, son of the late Dr. Geo. H. Cushing, was killed at Tropico, Cal., Jan. 23, 1903.

J. A. W. DAVIS, 65 years old, a dentist at Galesburg, Ill., died Feb. 10, 1903, from diabetes.

J. A. D. FORSYTH, 35 years old, a dentist at Anaconda, Mont., died Jan. 30, 1903, from an overdose of morphin.

F. R. HARKINSON, 28 years old, a dentist at Oakland, Cal., died Feb. 10, 1903, after a long illness. He was married five days before his death.

EDWARD NELSON, 61 years old, a dentist at Frederick, Md., died Feb. 7, 1903, of uremic poisoning.

T. O. M. SHERMAN, 37 years old, a dentist at Sandoval, Ill., died Jan. 27, 1903, after a long illness.

F. J. SHEA, a dentist of Chicago, is thought to be insane by his wife, who has applied to the courts for an expert examination.

G. H. WALTERS, 79 years old, a dentist at Waterbury, Conn., died Feb. 14, 1903, of pneumonia.

BANKRUPT.—O. A. Akers, Portland, Me., liabilities $545, assets $500.—H. T. Burrill, Boston, liabilities $2,217, no assets.

PARTING.—Brown: "Parting is such sweet sorrow." Jones: "I guess you never had a quinine capsule part just after you put it into your mouth, did you?"

MINISTERS CLOSE DENTAL OFFICES.—All the dentists of Sanford, Me., by request of the ministers of the town, have agreed to do no more work on Sundays except in extreme cases.

LARGE DIVIDENDS GUARANTEED.—"Enclosed find $1 for 1903 DIGEST. It is a good investment, yielding larger dividends than Standard Oil."—*K. E. Carlson,* St. Paul.

ILLEGAL PRACTITIONERS.—A dentist at Bowling Green, Ky., was fined $75 last month for practicing dentistry without a license.—A dentist at Brooklyn was fined $100 last month for the same offense.

TEXAS DENTISTS TO BE TAXED.—The Texas Legislature recently passed a bill providing for occupation taxes. The dentists at once presented a bill to exempt the dental profession in the state from the payment of such tax. They might have been successful had not the lawyers, physicians and other

professional men followed suit with other bills of like nature. We understand they will now all be taxed.

OMAHA DENTAL SOCIETY was organized Jan. 26, 1903, and the following officers were elected: President, J. H. Irvine; Vice-president, J. H. Wallace; Secretary, O. R. Kelley; Treasurer, H. S. Clemmer.

S. J. KENNEDY, the dentist of New York who recently figured in a sensational murder trial, and who has been at liberty on $10,000 bail, has been released without bail, the prosecution abandoning the case.

OAKLAND (CAL.) DENTAL CLUB held its annual banquet Feb. 4, 1903, and elected the following officers: President, J. L. Pease; Vice-president, F. W. Schwaner; Secretary, J. C. Gilbertson; Treasurer, W. F. Lewis.

JANESVILLE (WIS.) DENTAL ASSOCIATION held its annual meeting Jan. 29, 1903, and elected the following officers: President, Chas. T. Pierce; Vice-president, Ira Holsapple; Secretary and Treasurer, R. G. Hart.

TO PREVENT PLASTER ADHERING TO RUBBER PLATES.—H. E. Brubaker (*Summary*).—To prevent plaster sticking to rubber plate, rub the model well with borated talcum powder. Your plate will be finished beautifully.

DULUTH-SUPERIOR (MINN.-WIS.) DENTAL SOCIETY held its annual meeting Feb. 13, 1903, and elected the following officers: President, E. K. Medlar; Vice-president, S. W. Storer; Secretary and Treasurer, L. R. Moodie.

MARRIED.—H. B. KNOX, Oakland, Cal.; Mabel Merril, Oakland, Feb. 11.—C. A. McDermand, Bloomington, Ill.; Mattie C. Creamer, Bloomington, Jan. 28.—T. C. Smith, Bloomfield, Tenn.; Sarah Seales, Bloomfield, Jan. 19.

CHILD DIES UNDER DENTIST'S CHARGE.—An unregistered dentist at Marinette, Wis., administered medicine and performed medical services for a sick child, which died soon afterwards. He has been indicted by the coroner's jury.

LONG PREAMBLE.—The Doctor—"I had a tooth pulled yesterday, and I walked past the dentist's office a dozen times before I could summon up the necessary resolution?" The Professor—"It seems to me that was a pretty long pre-amble."

TO REMOVE OXID FROM GERMAN SILVER.—(V. E. Barnes (*Summary.*)—For cleaning oxid from German silver regulating appliances, commercial hydrochloric acid, full strength and cool, will act immediately. Neutralize acid with solution of sodium bicarbonate.

AN UNBELIEVER.—Here is a late story anent Christian Science. A Boston mother said to her little daughter: "If you had my faith, darling, you would have no toothache." The child replied: "Well, mother, if you had my toothache, you wouldn't have any faith."

DRYING PULP CAVITIES.—W. H. Weaver (*World*).—To dry the dental tubuli, after injecting a preparation of solution and removing the pulp at once, use a 50 per cent solution of alcohol, increasing strength 10 per cent every time and drying, until absolute alcohol is used the last time. It leaves vacant every space. It is immediately dried, so far as can be made so by

the use of any preparation. We all know that alcohol is the great absorbent of moisture.

LOUISVILLE COLLEGE OF DENTISTRY ALUMNI MEETING.—The alumni meeting of the Louisville College of Dentistry will be held March 27-28, 1903, at Louisville. The alumni and profession are cordially invited. An interesting meeting is expected, and the program will appear later.

NERVOUS.—Tenderfoot dentist: "Why, somebody has simply drilled your teeth without filling them." Alkali Ike: "That's right, pard." Dentist: "Wh—what was the mat—matter?" Ike: "Why, you see, I'm so nervous that I can't keep from shooting every time a nerve is touched."

MINNESOTA'S NEW SOCIETY.—The dentists of Glencoe, Hector, and neighboring towns in Minnesota have formed a dental association, to meet every three months, at some one of the towns. Officers are as follows: President, B. F. Allen; Secretary, W. L. Tifft; Treasurer, S. E. Bennoin.

DELAWARE COUNTY (PA.) DENTAL ASSOCIATION held its annual meeting Jan. 28, 1903, and elected the following officers: President, F. M. Smith; Vice-president, H. J. Haines; Secretary, J. H. Campbell; Treasurer, H. M. Smeadley; Executive Committee, S. B. Luckie, A. H. Grubb, R. M. Cox.

INSANE FROM DENTAL TROUBLE.—A man was recenty picked up in the streets in Los Angeles delirious and in a serious condition. On examination at the hospital it was found that his mouth was swollen almost shut by a huge dental abscess. Prompt and proper treatment soon brought him out of danger.

UNIVERSITY OF TENNESSEE DENTAL DEPARTMENT ALUMNI ASSOCIATION elected the following officers Feb. 12, 1903: President, J. Y. Crawford; 1st Vice-president, R. H. McGraw; 2d Vice-president, W. G. Walker; Recording Secretary, V. L. Sheperd; Corresponding Secretary, Wm. King; Treasurer, P. A. Williams.

EXAMINING BOARD AFFAIRS.—F. H. Orton, St. Paul, has been appointed on the Minnesota State Board of Dental Examiners.—George R. Warner, Grand Junction, has been appointed a member of the Colorado Examining Board.—T. P. Williams, Houston, has been appointed on the Texas State Examining Board.

ROBBERIES.—A sneak-thief at Nashville, Tenn., robbed several dentists in that town a few days ago, but, as is unusual in these cases, was arrested.—The dentists of Eureka, Cal., have been systematically robbed by a clever thief during the past few weeks. Several offices have been entered more than once.—The office of a dentist at Wilkesbarre, Pa., was robbed during the absence of the owner at the noon hour.

BARBERS TO BE REGULATED.—The health boards of Buffalo and San Francisco, as well as other places, have passed ordinances looking towards the prevention of the spread of disease through the medium of barber shops, tools, etc. The ordinances, of course, vary somewhat in form, but in the main are the same. First, a fresh clean towel must be used for each customer; second, barbers must keep their finger nails clean and cut short, and

must wash their hands before shaving each customer; third, all instruments must be disinfected after using, and razors must be wiped with alcohol both before and after; fourth, alum to stop the flow of blood shall be used only in powder form.

DENTISTRY FOR PAUPERS.—A bill has recently been introduced in the Massachusetts Legislature to provide for the care and preservation of the teeth of minors in the public institutions of the state. The newspapers are attacking it, believing that it is simply a move upon the part of the dental profession to secure appointments.

SENSITIVE NECKS OF TEETH.—Make an application of a saturated solution of the carbonate of potassium in glycerin. We do not know who originated this treatment, but it has proved very effective, and it does not discolor like the nitrate of silver. Apply as often as seems necessary till sensitiveness is relieved.—*Review.*

DENTAL FRATERNITY ELECTS OFFICERS.—Xi Psi Phi Dental Fraternity held its annual meeting at Chicago Feb. 18, 1903, and elected the following officers: President, Geo. Brown, Glen Falls, N. Y.; Vice-presidents, W. J. Montgomery and M. C. Schuler, Chicago; Secretary and Treasurer, C. C. Markey, Chicago. The next annual meeting will be held in St. Louis.

HUSBAND RESPONSIBLE FOR WIFE'S BILLS.—A man in Chicago recently refused to pay for some dentistry which his wife had had done, claiming that she had agreed to pay for same herself. The court ruled that such agreement was a private matter of which it could take no cognizance, and that the husband must pay the bill regardless of any promises by the wife.

FIRES.—E. Gardner, Redding, Cal., Jan. 16, loss nominal.—Dental parlors, Peoria, Ill., Jan. 11, loss $50.—J. C. Hague, Newark, Ill., Jan. 19, total loss.—J. M. Horred, Scottsburg, Ind., Feb. 6, total loss, no insurance.—P. D. Gainforth, Billings, Mont., Feb. 7, loss $50.—J. H. Borland, Tobias, Neb., Jan. 23, total loss, no insurance.—S. S. Benson, Hornellsville, N. Y., Feb. 13, loss $100.—R. J. Colter, Oklahoma City, Okla., Feb. 4, loss $1,000.

HOSPITALS NEED DENTISTS.—A writer in the *Medical Record* strongly urges that a capable dentist be added to the staff of every hospital and dispensary. He admits that the house physicians and surgeons cannot look after the matter, and he states that it is no use to dose patients with medicine when many of them are constantly swallowing any quantity of germs from unclean teeth, and in many cases large amounts of pus from abscesses.

ACTION OF DEMULCENTS.—Dr. J. H. Tappeiner conducted a large number of experiments on animals and human beings to determine whether the group of drugs known as demulcents really possess the property of allaying irritation. A distinct diminished irritability of motor nerves by chemical salts was found in the presence of mucilaginous substances. The same can also be said of sensory nerves, since pain appeared later and was less intense than in control experiments. The mucous membranes of the eyes and of the intestines gave less evidence of inflammation when demulcents were added. On the other hand, the cathartic action of drugs is enhanced, since their irritation is prolonged, owing to slower absorption. It was also found that this

absorption is less active in the stomach and the upper part of the intestines, and that this holds true for water also. All these experiments prove that the time-honored custom of using demulcents to allay inflammation and irritation is based upon scientific facts.—*Arch. Internat. de Pharmacodynam. et de Thér.*

Damage Suits.—A woman at Joplin, Mo., recently sued her dentist for $300 damages for an alleged injury to her jaw, resulting from extraction. The jury allowed her $25.—A woman at Buffalo has sued her dentist to recover $5,000 damages for alleged poor treatment of an upper cuspid.—A man in Boston is suing his dentist for carelessness in extracting two teeth.—A woman at Terre Haute, Ind., has sued her dentist for $10,000 damages, claiming that she contracted disease from dirty instruments which he used. The dentist claims that she had the disease when she came to him.

Arsenical Poisoning Cured by Orthoform.—A. D. Kyner (*Items*).—I had a case of acute arsenical poisoning with the conditions present so familiar to all. With a spoon excavator I removed the blackened gum tissue, syringed the parts with a warm antiseptic solution, soaked the gums and surrounding tissues with dialyzed iron, and applied a 25 per cent unguent orthoform. The pain in this case was the severest that I ever saw, and I must admit being astonished when the patient returned on the following day and reported that the pain had ceased and had not returned. Relief came within twenty minutes.

Setting a Banded Crown Painlessly.—When the parts are dried take a small probe and dip it in carbolic acid 95 per cent, then pass the end of the probe under the free margin of the gum, and carry it around the root so that the acid comes in contact with the surface of the gum touched by the band of the crown. This will not only anesthetize the gum and peridental membrane sufficiently to permit the band to go on painlessly, but it will sear the gum and the root. After setting the crown bathe the gum surrounding it with alcohol, to neutralize any permanent effect of the carbolic acid—particularly if too much has been used or it has touched the gum some distance away from the crown.—*Review.*

Hemophilia Treatment With Calcium Chlorid.—By C. Edward Wallis. The patient was a woman of twenty-five years, giving the typical history of hemophilia. Two months before coming to the writer for advice concerning her teeth, she had had a tooth extracted, with a resulting hemorrhage lasting thirty-six hours. The family history was negative. The girl herself looked very unhealthy. She was more or less a chronic dyspeptic. Her teeth were in a hopeless condition. She was ordered, as a preparatory measure to clearing the mouth, a course of calcium chlorid internally. She was to take a mixture containing 10 grains of this salt thrice daily for a week. At the end of this time one tooth was extracted. As long as this treatment was kept up, the results of extraction, which was gradually accomplished, were satisfactory. Leaving the town for a week, she neglected to take the salt, and on the extraction of the next tooth, the hemorrhage, although not alarming, was greater than after any of the other extractions since the treatment

had been followed. The dose was then increased to 15 grains, and the results were again most satisfactory. The writer treated another case of hemophilia in the same manner, with equally gratifying results.—*British Med. Jour.*

SHARPENING LANCETS, EXCAVATORS, ETC.—Disks made from emery paper Nos. 00 and ½, an inch and a half in diameter, are placed in alternate layers to about a quarter of an inch in thickness upon a disk made of tin slightly smaller in diameter than the emery disks and mounted on a screw mandrel. The tin disk serves to hold the paper disks flat while sharpening the instrument. Place the mandrel in handpiece and hold it with the left hand, leaving the right hand free to apply instrument to be sharpened in contact with the coarser grit to trim instrument to desired shape. Tear off this disk and finish the sharpening upon the finer grit. A keen, even edge can be given to the instrument in a very short time in this way.—F. J. PATTERSON, *Review.*

COMPRESSED AIR IN CLEANING THE TEETH.—Having a tube containing about an ounce of peroxid, full strength, an air-pressure of from 25 to 30 pounds will so divide the solution, sending it into every nook and corner, that stains and debris that it would otherwise take half an hour to remove will melt away as by magic.—W. H. POWELL, *Cosmos.*

Jane ate cake and Jane ate jelly,
Jane went to bed with a pain in her—
Now, don't get excited,
Don't be misled,
For what Jane had was a pain in her head.

—*Popular Mechanics.*

RIGHT-HANDEDNESS AND LEFT-HANDEDNESS.—So far as evidence goes it seems probable that right-handedness was a characteristic of man at a very early period. It is an inherent quality in the same sense that the potential quality of articulate speech in man and of song in birds are inherent possessions. Investigation shows that right-handedness is due to a transmitted functional preëminence of the left brain, and this factor prevents an oscillation of the condition from one side to the other in those curious cases in which the right and left sides of the body are reversed and the thoracic and abdominal viscera transposed. The greater part, if not the whole, of the motor incitations which lead to articulate speech go out from the speech-centre in the left cerebral hemisphere. Left-handed people speak from the right brain.

ACCIDENTS.—A young man at Rochester, N. Y., is having X-ray pictures made of himself for the purpose of locating a bur, which he recently swallowed while a dentist was working in his mouth.—A man has just died in New York from blood-poisoning caused by the extraction of a tooth six weeks ago.—A young man at Red Wing, Minn., had a tooth pulled a few days ago, and almost bled to death before the flow could be stopped.—A man at Appleton, Minn., had a tooth extracted under cocain Feb. 11. The hemorrhage was so great after leaving the dentist's office that he lay down in a barn

and choked to death from the blood running down his throat and stopping up the air passages.—A man at Shell Rock, Ia., died Feb. 11 from hemorrhage which had persisted since the extraction of a tooth one week previous.—A man in St. Paul died last month from hemorrhage following the extraction of several teeth.

LIBELOUS.—According to the New York papers, dentists in Philadelphia do not find it necessary to give anesthetics when extracting teeth, as the patients rarely wake up.

QUININE.

Oh, the city is sounding with beautiful bells
When your system is full of quinine.
You list to the chorus that echoes and swells
And the shivering germs hear their funeral knells,
As in terror they fly down your spine,
And the microbes, like sprites who for mischief still lurk,
In your head build a sawmill and set it to work.
All the world is astir,
'Tis a resonant blur,
The universe whirls with a whiz and a whir,
The stars and the planets rush on till you feel
Like the dull, helpless hub of a hurrying wheel.
You long to keep still
And you try with a will,
For you fear the results of a general spill
That will send you afar like some recreant star
Through the vast milky way with a jolt and a jar.
And your dreams—they are full of such dreadful dismay
That memory revolts and forbids them to stay.
You try to get rid of these fancies malign,
But you can't, when your system is full of quinine.

—*Washington Star.*

POSTURE AS AN AID TO DIGESTION.—Ogarkow (*Archiv fur klinische Medicin,* 1901, Bd. lxxi.; *Medicine,* September) has determined experimentally that the stomach empties itself most rapidly when the individual is lying upon the right side, and also when he is walking rapidly. When standing, sitting, lying on the left side, or walking slowly, the conditions are less favorable for the rapid emptying of the organ. When lying upon the back or face, the conditions are less favorable than when upon the right side, but somewhat more so than in a standing position. Link (*Therapie der Gegenwart,* May), also, is of the opinion that it is important in certain pathological changes in the stomach to have the patient keep a position upon the right side for a considerable time after taking food. It is stated that this simple procedure is of considerable therapeutic value. According to a French writer, recently cited by *Medicine,* the post-prandial position on the right side has

proved of great service in cases of acute indigestion, and also in passive stasis of the stomach contents.

FISSURE OF THE HANDS.—The following is recommended by Steffen in *Bul. Gen. de Ther.* as an ointment in the treatment of fissures of the hands:

℞. Menthol ..... gr. xx
Salol
Olei olivæ, aa ..... ℥ss
Lanolini ..... ℥ii
M. To be applied twice a day.

J. Nevins Hyde employs the following for cracked and chapped hands:

℞. Tinct. benzoini ..... ℥iss
Tinct. tolutani ..... m. lxxv
Glycerini ..... ℥ss
Spts. vini. rect. ..... ℥iii
Aq. rosæ q. s. ad ..... ℥vi
M. Sig.: Wash the hands thoroughly in warm water and apply locally night and morning.

HE WOULD KNOW.—First Girl: You can't make me believe that all that hair on Kate's head is her own. I am going to ask her hair-dresser if she doesn't wear a switch. Second Girl: You would better ask her dentist.

MOLECULES AND CORPUSCLES.—In an address on measurement and calculation Professor Woodward of Columbia University presents an illuminating view of the philosophy of the subject, with examples of special applications. The whole address (as printed in *Science* for June 20) should be read by those interested. A few paragraphs on a special topic are here presented. To begin with quantities near the lower limit of determination, think, for a moment, what is going on in the air around us. It is known that there are about a million million million molecules in a cubic millimetre of air. Notwithstanding this apparently crowded assemblage, the individual molecules move about in the liveliest manner, their average speed being about five hundred metres per second. The average length of their unimpeded journey is barely visible in the best microscopes. Each molecule collides with its neighbors about 5,000,000,000 times every second. The properties of the individual molecules are especially interesting in cases where they are made up of two or more atoms. Such miniature systems are probably comparable in complexity with the Martian and Jovian systems of our solar system and exhibit

certain constant habits; for instance, their rates of vibration, as determined by the spectroscope, are invariable. The vibrations are executed at the rate of some hundreds of millions of millions per second. Cadmium molecules, for example, vibrate about 600,000,000,000,000 times per second.

Recent investigations point to the conclusion that there is another order of bodies of much smaller dimensions, possessing still more wonderful properties. These have been called corpuscles. Their density is only about one-thousandth part of that of hydrogen; they are freely given off by several of the so-called radio-active substances, and they move with speeds of the same order as that of light.—*New York Sun.*

Phlebitis of the Ophthalmic Vein and of the Cavernous Sinus, Following a Dental Abscess.—N. Couderc reports this very interesting case. The patient was a man 32 years old, large and strong. He was not an excessive drinker. He had never been ill, with the exception of a succession of a series of dental abscesses which developed at the same time about carious molars in the lower maxilla on the left side. On the eighth of December, 1898, a new dental abscess appeared on the left side. This was accompanied by fever and very pronounced swelling of the gum. The urine contained no sugar or albumin. On December 11, the fluctuating point was lanced. This was followed by a flow of pus from the wound. Purulent expectoration continued all day. There was no amelioration of the local symptoms; on the contrary, the patient grew worse. The swelling increased and extended behind the angle of the jaw. On the morning of December 13 there was a violent chill, lasting an hour, and followed by profuse sweating. This was repeated that evening and three times the next day. The fever increased, and so did the swelling. The whole left side of the face was swollen, and the trouble extended down towards the neck. The fever continued and the chills recurred every day. The liver and spleen were enlarged. Abundance of fluid was administered, and purgatives as well. The patient was also bled. But it did no good. The tissues were hard. It was a difficult problem to know what to do. On December 17 a very grave new symptom appeared. It was exopthalmous of the left eye, which extended that evening to the right eye. Conjunctival chemosis developed at the same time. Vision was disturbed. The patient, who retained consciousness, complained of severe lancinating pains in all of the inflamed region. Another painful focus developed in front of the left ear. The skin was clammy, the mouth was dry and the lips fuliginous. On December 18 a large opening was made at the level of the left masseter. The bone was reached, but not a drop of pus appeared. The bone was denuded at every point reached by the probe. It was a subacute necrosis, for it had been scarcely ten days since the beginning of the trouble. After the operation the patient fell into a semi-comatose state. The next day the patient's condition was pitable. On December 20, he was able to reply with pain to questions. The face was enormous, the eyes protruded, but not a drop of pus came from the incision. The wound was dry. That evening he became delirious and toward morning he died. The infection had without doubt reached the branches of the facial vein, and from there

had penetrated by the anastomotic vessels to the ophthalmic vein. This was shown by the exophthalmos and the chemosis, which are constant signs of phlebitis of the ophthalmic vein. From there it reached the cavernous sinus. This was indicated by the delirium, the agitation and the semi-comatose state. It is probable that there existed in the patient at the same time an infectious phlebitis and a diffuse subacute phlegmon, with mortification of the tissues.—*Journal des Praticiens.*

INDEX TO ADVERTISEMENTS.

Abbott Alkaloidal Co..... 4
American Cabinet Co..... 66
American Hard Rubber Co..... 80
Antikamnia Chemical Co..... 55
Antidolar Mfg. Co.—Anesthetic.... 60
Atlas Dental Lab. Co..... 53
Austin, Robt.—Specialties..... 75
Baltimore College of Dental Surgery 91
Barker, W. H.—Polishers..... 53
Bennett, G. L.—Forceps..... 83
Berry Dental Laboratory..... 78
Berry Liquid Gold Co..... 78
Brewster, R.—Porcelain 50-59
California Univ. Dental Dept..... 84
Chicago College Dental Surgery.... 88
Chicago Post-Graduate Dental Coll.. 87
Cincinnati College Dental Surgery.. 88
Clark, A. C., & Co.—Spittoon..... 52
Colorado College Dental Surgery.... 84
Dearborn D. Mfg. Co..... 48
Dee, Thos. J., & Co.—Refiners..... 62
Detroit Dental Mfg. Co.—Specialties 64
Dentacura Co. 2
Dental Protective Supply Co.—
Angle Attachment 20
Ductile Alloy 19
Fellowship Alloy 15, 23
Fellowship Burs 6
Fellowship Cement 11
Fellowship Teeth 25
Fellowship Oxyphosphate 7
Fellowship Twist Broaches..... 12
Fellowship Broaches 13
Fellowship Dental Engine..... 14
Fellowship Handpiece 28, 29
Fellowship Lathe 21
Fellowship Automatic Mallet..... 22
Fellowship Right-Angle Mallet.... 16
Fellowship Slip Joint..... 17
Fellowship Cement, Spatula, etc... 24
Mail Orders, etc. 27
Mouth Mirrors 10
Repair Work 18
Rubber Dam 26
Wants, For Sale, Etc..... 34
Dental Specialty Co..... 34
Electro Mfg. Co.—Battery..... 40
Florence Mfg. Co.—Tooth Brushes.. 96
Georgetown Univ.—Dental Dept. ... 93
Gesswein, F. W., Co.—Ruby Crystal. 32
Goldsmith Bros.—Refiners 31, 45
Goodrich, B. F., Co.—Rubber..... 82
Graves, E. L.—Tooth Powder....Cover
Green, L. O.—Acestoria..... 71
Griswold, D. B., Co.—Bridge..... 36
Howard, C. T.—Strips..... 32
Harvard University—Dental Dept.. 95
Hall, Wm. R., & Son—Specialties... 61
Ideal Chemical Co.—Anesthetic..... 68
Illinois Dental Laboratory Co..... 69
Illinois University—Dental College.. 86
Indiana Dental College 84
Invalid Appliance Co..... 51
Johnson & Johnson—Specialties.... 49
Klewe & Co.—Jenkins' Porcelain... 30
Knapp, H. G.—Ramesite Cement.... 42
Kress & Owen—Glyco-Thymoline..Cover
Lambert Pharmacal Co.—Listerine.. 1
Lavoris Chem. Co. 63
Leininger, C. S.—Obtundo 74
Martin & Anson—Air Pumps..... 47
McConnell, J. W.—Chair..... 49
McKesson & Robbins....Cover page 3
Manhattan Dental Co.—Pl. Stiffeners 84
Marion-Sims Dental College..... 85
Meier, D. M., Co.—Specialties..... 50
Minn. Univ.—Coll. of Dentistry..... 95
Missouri Dental College..... 90
Morgan & Wright..... 70
Morgan-Maxfield—Disk Mandrel 49
Morgan, Hastings & Co.—Gold Foil.36-72
Mutual Dental Supply Co..... 70
Nelms, H., & Son—Gold..... 77
New York College of Dentistry.... 89
New York Dental School..... 94
Northwestern Univ.—Dental Dept.. 92
Oakland Chem. Co.—Hydrogen Dioxid 3
Odontunder—Anesthetic 76
Ohio College of Dental Surgery.... 90
Parke, Davis & Co..... 5
Peck, A. E.—Inlay System..... 61
Penna. College of Dental Surgery... 93
Place, J. W.—Crown System..... 76
Polk, R. L.—Register 32
Roach, F. E.—Wedgelock Facing... 38
Rutherford, A. S.—Specialties..... 74
Sams, W.—Blowpipe 73
Sanitol Co.—Sanitol 2
Saranac Electric Co..... 46
Scharmann, G.—Cement and Burs.. 65
Schering & Glatz—Eucain..... 82
Sims Hydraulic Engine Co..... 81
Smith-Premier Typewriter 36
So. Calif. Univ. Coll. of Dentistry.. 95
Sprague, J. A., & Co.—Pustolene.... 40
Star Specialty Co..... 74
Superior Strip Co. 40
Teague, D. S., Co.—Specialties..... 79
Tuller, R. B.—Instrument..... 44
Turner Brass Works—Furnaces.... 54
Twist, Dr. J. F.—Crowning Outfit.. 67
Vegetol Co.—Vegetol 60
Willson, H. B.—Patents 36
Western Reserve Univ.—Coll. of Dent. 95